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METEOROLOGIC ASPECTS OF NEW ORLEANS ASTHMA. A STUDY OF RELATIONSHIPS BETWEEN METEOROLOGIC VARIABLES AND ASTHMA ADMISSIONS TO CHARITY EMERGENCY CENTER, NEW ORLEANS, LOUISIANA

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TULANE UNIVERSITY
SCHOOL OF MEDICINE
NEW ORLEANS

A STUDY OF RELATIONSHIPS ✓
BETWEEN METEOROLOGIC VARIABLES
AND
ASTHMA ADMISSIONS TO CHARITY EMERGENCY CENTER
NEW ORLEANS, LOUISIANA

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PREFACE

The study which is reported in the following pages was made possible by the generous contribution of many people.

Dr. Albert Roberts and Dr. L. Otis Emik of the U. S. Public Health Service Air Pollution Medical Program have contributed greatly to the general design of the study, and in suggesting pertinent areas for analytic emphasis.

The Louisiana State Health Department has made a direct contribution in terms of donated time of machine records equipment and has contributed indirectly in the form of advice and consultation from Mr. John S. Lemasson.

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The authors are indebted to a host of other consultants and advisors of Tulane University, and of the Taft Engineering Center, to Dr. J. Nelson Dingle of University of Michigan Department of Meteorology, and to Dr. W. P. Gardiner, Director of Health, New Orleans, and the members of the Health Department for their advice and cooperation.

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Chapter 1. Introduction

In the Emergency Center, Charity Hospital, New Orleans, the staff has known for several years of wide fluctuations in the daily number of admissions for emergency treatment of respiratory embarrassment. The number of admissions has occasionally reached as many as 150 in one day. The daily fluctuations in the admission rate have turned suspicion to the possibility of meteorologically common exposure to some unknown substance responsible for setting off the asthmatic response in large numbers of persons in a relatively short period of time.

The common diagnostic term used for these cases is "asthma", although relative few of the cases had diagnostic review. *

In August of 1958 an outbreak occurred involving approximately 100 people with 3 deaths tentatively ascribed to that cause. The event was reported in the local press and reached the wires of national news agencies, attracting the attention of the U.S.P.H.S. Air Pollution Medical Program. Personnel from that program and from Taft Engineering Center converged on New Orleans immediately after the outbreak to investigate the nature of the event and determine whether air pollution might have been involved.

The long local history of emergency asthma admissions, together with occasional increase in daily incidence to "epidemic" proportions, became known to the air pollution medical program at that time. There was sufficient evidence from study of the August, 1958 outbreak to suspect that some unknown contaminant in the atmosphere may have been involved.

The following is the report of a study undertaken under the aegis of the Air Pollution Medical Program by Contract #SAph 71123, with Tulane University Medical School.

The purpose of the study is to investigate the nature, frequency, and possible causes of reported episodes of marked increases in the

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* Reference below to "admissions", "cases" and "asthma" refer to persons seeking treatment for emergency respiratory embarrassment, unless specified otherwise.

cont fr incidence of certain respiratory conditions in the New Orleans area.

The study has been restricted to persons admitted for acute respiratory embarrassment to the Charity Hospital emergency clinic and to the period since December 1, 1957.

The objectives are to determine the demographic and clinical characteristics of the persons under study, to determine the temporal and geographic aspects of acute respiratory embarrassment, to identify local point and area sources of air pollution, and to determine whether relationships exist between weather variables for the period in the geographic and temporal characteristics of the admissions.

Nature of the area and of the population under study

New Orleans is virtually surrounded by water, with Lake Pontchartrain only 5 miles north of the Weather Bureau Office, Lake Borgne 12 miles east, Lake Salvador 10 miles south-southwest, Lake des Allemands 24 miles west and the open Gulf of Mexico 55 miles south. The terrain over the entire area is largely marshy delta land cut by numerous bayous, drainage ditches and canals. The Mississippi River flows in a general southwest-northeast direction, passing within 5/12 mile of the Weather Bureau office. Elevations within the city vary from a few feet below to a few feet above sea level. Land in the vicinity of the city is heavily wooded with semi-tropical growth. The thermometers and rain gages are on the roof; temperatures are affected slightly by steam and smoke from nearby coffee mills. Temperatures on cold nights under calm conditions are sometimes considerably higher at the roof exposure than at ground level in the city and surrounding areas. Wind velocities and directions are adversely affected by taller buildings to the west and north.

Temperature. The annual temperature varies only slightly from year to year, ranging from 67 to 72 degrees. The mean annual temperature for the period of record is 69.7 degrees, ranging from 55.1 degrees in

January to 82.7 degrees in July. In general there is a range of from 13 to 16 degrees from the low to the high temperature each day. The greatest daily range occurs in March--16.0 degrees, while the least daily range occurs in September and amounts to 13.4 degrees on the average. Variations in monthly mean temperatures are slight from year to year. The greatest variation occurs in January and the least in July. The coldest January was 1940 when the monthly average was 43.0 degrees while the warmest January was 1950 with a monthly average of 67.2 degrees. The warmest July was 1932 with a monthly average of 85.2 degrees and the coolest was in 1894 with an average of 79.3 degrees. Thus, the range from coldest to warmest month was 24.2 degrees in January and only 5.9 degrees in July. The warmest summer of record was 1951 when the t temperature for June, July and August averaged 84.7 degrees. The coldest winter was that of 1885-86 when the temperature for December, January and February averaged 50.9 degrees. Temperatures of 100 degrees or higher have occurred only 16 times since 1874. Temperatures 95 degrees or higher occur on an average only 5 times a year. The longest period when daytime temperatures were 90 degrees or higher was 41 days from July 31 to September 9, 1951. Only 23 times during the 76 years of record has the temperature fallen as low as 24 degrees and only 12 times has it failed to rise above 32 degrees during the daytime. The longest perior with minimum temperatures 32 degrees or lower was 7 days from January 23 through January 29, 1940.

Precipitation. New Orleans is one of the wettest cities in the United States. meteorologically speaking. There are two fairly definite rainy periods. The period of summer showers lasts from about mid-June to mid-September and the period of winter rains from mid-December to mid-March. April, May, October and November are generally dry but this fact is somewhat masked in the mean by some extremely heavy individual rains in those months. The mean daily rainfall for days with rain is about 1/2 inch except in April when it is about 3/4 inch.

Winter rain is generally slow, steady and continuous, often lasting several days. It occurs to the north of a warm front or a cold front which has stalled over the northern Gulf of Mexico. Summer showers are scattered and localized. There is a 50-50 chance of rain at any point in the city every day in July. In a normal July, rain falls somewhere in the city every day of the month. These showers tend to keep the daytime temperatures from rising much above 90 degrees. The time of the maximum temperature shifts from the usual 3-4 p.m. to 1-2 p.m. for, during the summer, these showers occur most frequently between 1 and 2 p.m. There is also a slight peak frequency in the early afternoon during spring and fall, but during the winter rain is as apt to fall in one hour as another. The longest dry spell, 52 consecutive days without rain, lasted from September 29 to November 19, 1924.

The first measurable snow since January 22, 1935 (0.1 inch) fell February 12, 1958 and measured 1.3 inches. The previous comparable snow was 3.0 inches on February 12, 1899.

Storminess. Tornadoes are extremely rare. While thunder is usually heard during summer showers, thunderstorms are confined to fall, winter and spring months and are relatively infrequent. The most damaging thunderstorms are those which move over the city from Lake Pontchartrain, usually in connection with the passage of a cold front. But linesqualls which have moved eastward across the state have also, on occasion, affected the area. During the summer months, occasionally a thunderstorm will develop over Lake Pontchartrain in the early evening and mover over the city causing damage. New Orleans lies in the hurricane belt. During the nineteenth centure hurricanes damaged the city with discouraging frequency but during the past half-century only three hurricanes have passed over the city. On September 29, 1915, and on September 19, 1947, New Orleans was swept by the full fury of a hurricane which had moved from a point east of the West Indies across the Gulf of Mexico. The fastest mile of wind recorded in these hurricanes was 98 miles per hour. The third hurricane was on September 3-4, 1948, but the winds were barely of hurricane velocity. *

New Orleans has a population of approximately 600, 000 in a metropolitan area of approximately one million. As of November, 1958, at the time of the last city census, the population was approximately 35 per cent Negro.

The city is generally not segrated with respect to residential areas although some sections of the city are more heavily populated with Negroes than others.

The source of information about asthma cases is the record system of the Emergency Center at Charity Hospital of Louisiana - New Orleans. Utilization of Charity Emergency Center is approximately 90 per cent Negro and is the only free emergency center in the city. It is the only emergency facility reporting wide fluctuation in emergency asthma admissions. (Figure ~~1~~). 3 2

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* Source: U.S. Department of Commerce, Weather Bureau, Local Climatological Data.

Chapter 2, Section I: Introduction to Retrospective Analysis

Hourly surface weather observations from Moissant Airport meteorologic station were made available in punched-card form for the period July 1956 through January 1959.

Information for asthma emergency cases admitted to Charity Accident Emergency Service were transferred from bound record books into punched-card form, for all asthma admissions to the service in the period December 1, 1957 through November 30, 1958. Basic case information includes age, race, sex, date and time of admission, census tract of residence, a regional code for grouped census tracts, and person-identification.

The case and weather records were matched by hour. Basic weather information pertaining to the hour of admission was punched into the case deck, so that each admission is associated with weather variables reported as of the beginning of the hour of admission. (Appendix B).

Inspection of Appendix B will reveal the important details of data handling and the definition of variables.

Comments about details of, and restrictions imposed by, the method of the study are included at appropriate points in the body of the text.

Chapter 2, Section II

Retrospective Study of Asthma Admissions at Charity Emergency Center and Meteorologic Characteristics in the Period December 1, 1957 through November 30, 1958.

Approximately 90 per cent of 15,639 asthma admissions from New Orleans during the period were Negro, as compared to about 35 per cent of the population of New Orleans city being Negro. There is no evidence that the difference is entirely explained by the peculiar characteristics of the population utilizing Charity Hospital; query of other emergency facilities shows no such phenomena of outbreaks.

Analyses leading to the following results and discussion are restricted to 13,978 Negro admissions with known residence in the city of New Orleans, during the period from December 1, 1957 through November 30, 1958.

There were 213,313 Negroes residing in New Orleans as reported in the census of November 28, 1958. Of these, 99,933 were male and 113,380 were female. The excess of females prevails throughout most regions of the city. A similar differential appears in the admissions at Charity Hospital for asthma emergency treatment, so that observations of sex differential among admissions appear adequately explained in terms of the population in the area. The percentage distribution by age group for the New Orleans Negro population and for the admissions is as follows:

Table 2-II-1

Age	Population	Admissions*
0-9	27.	12.
10-34	36.	37.
35-59	28.	37.
60 +	9.	13.

* Muitiple admissions in day removed

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— also deficit in admissions 0-9 yrs

Comparison indicates an excess in admissions in the older age group. Information relating age, sex and region to persons affected, rather than admissions, is not available. Further, guesses about age-specific prevalence rates from Charity Hospital patients are not appropriate because of the effect of selection of patients on geographic and economic bases.

Classification by number of admissions within the year for Negro individuals of New Orleans shows that about two-thirds of the persons involved had one admission during the year.

An exact count of the number of persons involved was not possible because of the form of records from which admission information comes.

References in the retrospective study to "number of persons" (as differentiated from "number of admissions") depend on an approximation method: the admission records were sorted on age, sex, street address number and census tract. A master card was punched for each of the subsequent groups. The master card is said to represent an individual.

The method tends to cause a shift to the left in the distribution of number of admissions by ignoring moves within the city and ignoring change in age.

The method tends to cause a shift to the right by combining admissions for persons of same age, sex, street address and census tract.

The latter (shift to right) is seemingly remote.

The ignoring of age (shift to left) is sufficient to destroy the usefulness of the general results; however, change in age has no chance to operate for individuals with one admission, and a much smaller chance to operate for persons with two admissions than for persons with many. For these reasons, the estimates of the number of persons with one or two admissions seem "reasonable."

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Table 2-II-2

Frequency of Admission for Negroes of New Orleans Residence (12-1-57 through 11-30-58)

Number of admissions during period	Number of persons*
Total	3332
1	2019
2	467
3	200
4	125
5	99
6	64
7	46
8	29
9	36
10 +	257

+ %

SEASONAL EFFECTS

Table 2-II-3 shows the distribution of admissions by age group by month from December 1957 through November 1958 together with the proportion of total admissions for the age group. A graph of the proportional distribution shows that there were proprotionally fewer cases among the 35 plus group throughout the period October through April, that the age group 0 through 34 has proportion approximately equal to 35 plus in the month of May, and then a crossover to a proportional majority in the 35 plus group throughout the period June through September.

* See immediately preceeding text for description.

Table 2-II-3

Number and Proportions of Negro Admissions Attributed to Age Group for Each Month

December 1957 - November 1958

Month	Total Admissions	Age Group 0-9		10-34		35-59		60 +	
		No.	Prop.	No.	Prop.	No.	Prop.	No.	Prop.
Dec. 1957	1629	145	.09	725	.45	578	.35	181	.11
Jan. 1958	1271	153	.12	558	.44	410	.32	150	.12
Feb. 1958	872	101	.12	371	.43	298	.34	102	.12
Mar. 1958	990	162	.16	378	.38	321	.32	129	.13
Apr. 1958	1095	181	.17	418	.38	349	.32	147	.13
May 1958	1222	155	.13	438	.36	443	.36	186	.15
June 1958	1098	104	.10	297	.27	508	.46	189	.17
July 1958	1109	60	.05	326	.29	506	.46	217	.20
Aug. 1958	977	79	.08	276	.28	428	.44	194	.20
Sept. 1958	600	80	.13	186	.31	250	.42	84	.14
Oct. 1958	1337	208	.16	545	.41	458	.34	126	.09
Nov. 1958	820	143	.17	349	.43	279	.34	49	.06
TOTAL	13020	1571	.12	4867	.37	4828	.37	1754	.13

Classification of persons with ten or more admissions during the year, according to a very drastic rule to inspect the May - September period produces the following results:

Table 2-II-4

Age Group	Admissions in May through September only	Admissions throughout the year, involving at least one month outside the May - September period	Total
0-34	0	109	109
35 +	22	126	148
Total	22	235	257

The classification leads to the idea that apparently there is some agent which affects certain persons only in the summer period. These persons have in common that they are aged over 35. Similar tabulations for the winter period did not produce significant evidence of a relation between age and season.

WIND VELOCITY EFFECTS

For the period December 1, 1957 through November 31, 1958 the days were classified according to number of admissions and the wind velocity total for the 24 hourly observations of the day (Table 2-II-5). Average velocity is obtained for a day by adding up the total observed knots of wind (without regard to their direction) and then dividing by the number of observations. Such a statistic might be considered an index of the ventilation of the area. The concept "breaks down" however, in the event of extremely variable winds.

A chi-square test for independence between the two classifications of admissions and wind velocity indicates a relationship between the wind speed and the number of admissions per day, with an excess

Table 2-II-5

Days of Period December 1957 Through November 1958

Categorized by Grouped Number of Admissions

and Average Wind Velocity

Average Wind Velocity	Number of Admissions		
	Total	0 - 49	50 +
0 - 4	41	27	14
5 - 9	237	203	34
10 +	87	77	10

of days on which there were 50 or more admissions at low wind speeds.

When the number of admissions per day is plotted against the wind speed for the given day, the resultant scatter of points fall in a distinctive triangular distribution. The cluster of points is produced by wide variation in the number of admissions per day for low wind speed (and including very high admission rate days). Admissions per day were consistently low for higher wind speeds.

Considering days with average wind speed less than 5 miles per hour (44 such days in the year) they were classified according to day of the week and tabulated with regard to the number of admissions (tabulation not included). There is no evidence to indicate a difference in admission rates from one day of the week to another.

WIND DIRECTION EFFECTS

One elemental analysis of the relationship between wind direction and admissions for asthma, is a comparison of the daily admissions recorded in the Emergency Center with the monthly summary of meteorologic characteristics in the area published by the U. S. Weather Bureau. Table 2-II-6 shows these data (reference will be made in Chapter 3, Section I, to the tables which concern the year 1959). The monthly summary publication of local weather includes "prevailing wind direction", for each day at the observation station located in the city of New Orleans at the post office building. "Prevailing" wind is shown to the nearest point of an eight point compass and is that direction most frequently recorded during the 24 hour period. Correction in the data provide that "calm" is not a possible prevailing condition.

Table 2-II-7 shows the admission rate per day for each of the eight wind directions. The table appears to show a higher admission rate on days for which the prevailing wind was southwest. However, Table 2-II-8 shows the percentage distribution of days and the percentage distribution of admissions according to the eight directions. Since there

Table 2-II-6

Total Admissions in the Period Dec. 1, 1957 through Nov. 30, 1958 by Prevailing Wind Direction* on Day of Admission and by Month

Prevailing Wind Direction on Day of Admission

	Total	N	NE	E	SE	S	SW	W	NW
Dec. '57	2062	165	71	305	629	226	217	146	249
Jan. '58	1633	43	445	152	141	116	157	375	204
Feb.	1127	252	228	132	47	97	37	114	220
March	1277	323	71	241	301	0	0	78	263
April	1432	33	39	245	256	305	154	209	191
May	1579	483	51	0	323	538	0	48	136
June	1449	155	30	80	206	655	242	81	0
July	1443	0	89	54	447	531	0	322	0
August	1292	139	0	0	253	363	0	473	64
Sept.	778	31	142	174	268	64	77	22	0
Oct.	1740	291	651	312	237	0	99	0	150
Nov.	1214	130	495	232	38	230	0	48	41
TOTAL ADM.	17026	2045	2312	1927	3146	3125	1037	1916	1518
TOTAL DAYS	365	45	53	46	73	64	15	40	29

Negro Adult Admissions in the Period Dec. 1, 1958 through Nov. 30, 1959

Dec. '58	829	92	312	76	0	12	207	97	33
Jan. '59	501	82	87	98	17	148	0	26	43
Feb.	372	34	112	100	0	64	29	0	33
March	475	28	130	50	81	33	85	0	68
April	590	64	153	0	84	129	117	11	32
May	498	0	50	11	94	225	41	0	77
June	607	22	130	71	13	221	80	37	33
July	703	97	0	49	141	168	12	14	222
Aug.	434	17	107	61	85	33	0	0	131
Sept.	424	31	95	99	44	25	82	0	48
Oct.	680	27	323	36	0	117	89	0	88
Nov.	957	167	358	189	39	130	0	17	57
TOTAL ADM.	7070	661	1857	840	598	1305	742	202	865
TOTAL DAYS	365	34	88	51	38	70	31	8	45

* Wind direction measured at Moisant Airport at the beginning of the hour of admission.

Table 2-II-7

Admission Rate per Day for All Admissions, Dec. 1957 through Nov. 1958, and for Negro Adult Admissions, Dec. 1958 through Nov. 1959 according to Prevailing Wind Direction* on the Day of Admission

		Prevailing wind for each day recorded at New Orleans Post Office							
	Total	N	NE	E	SE	S	SW	W	NW
Dec. '57 - Nov. '58	46.6	45.5	43.6	41.9	43.1	48.8	69.1	47.9	52.3
Dec. '58 - Nov. '59	19.4	19.4	21.1	16.5	15.7	18.6	23.9	25.2	19.2

Table 2-II-8

Percentage Distribution of Admissions and of Days for Each Period

	Prevailing wind for each day recorded at New Orleans Post Office							
	N	NE	E	SE	S	SW	W	NW
Dec. 1957 - Nov. 1958								
Percent of Days	12.3	14.5	12.6	20.0	17.5	4.1	11.0	7.9
Percent of Admissions	12.0	13.6	11.3	18.5	18.4	6.1	11.3	8.9
Dec. 1958 - Nov. 1959								
Percent of Days	9.3	24.1	14.0	10.4	19.2	8.5	2.2	12.3
Percent of Admissions	9.3	26.3	11.9	8.5	18.5	10.5	2.9	12.2

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* "Prevailing wind direction" as reported by the U.S. Weather Bureau from observations at New Orleans Post Office.

is less than two per cent difference for any direction, differences in attack rates seem to be questionable.

Table 2-II-9 shows asthma admissions according to the given wind direction at the time of admission and grouped according to the number of admissions per day.

Table 2-II-10 shows the percentage distribution of admissions for each grouped number of admissions per day.

There is a continuously increasing percentage of cases related to South - Southeasterly through Southwesterly wind direction and a continuously decreasing percentage of cases involved when the wind direction at time of admission is in the quadrant from East - Northeast through Southeast. For the quadrant West - Southwest through Northwest there is a continuous increase for the four grouped sets of days running from 0 through79 cases. However, that quadrant is rarely involved at the time of admission for days with 80 or more admissions per day. The table also indicates a powerful effect of "calm" at the time of admission, for outbreak days.

Table 2-II-11 shows some details of admission for the 20 days with 80 or more admissions per day. In four of the twenty days the greatest number of admissions were during a period of calm. In two of the days the greatest number of admissions was at the time when wind was from the quadrant North - Northwest through Northeast. On none of the twenty days was the major number of admissions during a period when the wind was from a quadrant East - Northeast through Southeast. In 11 of the 20 days more cases were reported during a period when the wind was from the quadrant South - Southeast to Southwest, and in two of the days the major number of cases were admitted when the wind was in the quadrant West - Southwest and Northwest.

Seven of the 20 days with 80 or more admissions occurred in December of 1957. Three of them in May of 1958, three in August of 1958 and four in October of 1958. The other three days were incidentally

Table 2-II-9

Number of Admissions per Given Wind Direction, Grouped by Days According to the Number of Admissions per Day

(12-1-57 through 11-30-58)

Grouped days according to number of admissions per day	Number of Days Involved	Direction of Wind* at Time of Admission					Total Admissions	Average Number of Admissions per day of group
		Calm	NNW through NE	ENE through SE	SSE through SW	WSW through NW		
0-19	10	2	44	67	33	20	166	16.6
20-39	134	242	1343	1085	992	634	4296	32.1
40-59	158	475	2300	1609	1980	1249	7613	48.2
60-79	43	127	530	454	1110	697	2918	67.9
80 +	20	560	195	261	823	194	2033	101.6
Total	365	1406	4412	3476	4938	2794	17026	46.6

---

* Wind direction measured at Moisant Airport at the beginning of the hour of admission.

Table 2-II-10

Percent of Admissions by Wind Direction at the Time of Admission

Grouped days according to number of admissions per day	Number of admissions involved	Direction of Wind at time of admission				
		Calm	NNW through NE	ENE through SE	SSE through SW	WSW through NW
Total	17026	8.3	25.9	20.4	29.0	16.4
0-19	166	1.2	26.5	40.4	19.9	12.0
20-39	4296	5.6	31.3	25.3	23.1	14.8
40-59	7613	6.2	30.2	21.1	26.0	16.4
60-79	2918	4.4	18.2	15.6	38.0	23.9
80 +	2033	27.5	9.6	12.8	40.5	9.5

Table 2-II-11

Number of Admissions by Wind Direction by Date for the Twenty Days on Which 80 or More Admissions Occurred. (12-1-57 through 11-30-58)

Date	Number of Admissions	Wind Direction at time of Admission				
		Calm	NNW through NE	ENE through SE	SSE through SW	WSW through NW
12 01 7	178	98		19	59	2
12 02 7	97	42		7	48	
12 03 7	96	23		19	34	20
12 05 7	87	37		29	21	
12 08 7	102	6			30	66
12 10 7	93	26			55	12
12 12 7	83	64		12	7	
01 30 8	115	4		10	101	
05 08 8	109	39		21	49	
05 28 8	96		2	16	58	20
05 31 8	102	38		5	59	
06 29 8	80	40	20	20		
07 17 8	86		20	8	26	32
08 07 8	87	34	9	6	34	4
08 22 8	84	15	7	20	38	4
08 23 8	81	2		8	68	3
10 21 8	173	47	12	33	73	8
10 22 8	99	27	7	6	56	3
10 26 8	99	18	51	22	7	1
10 27 8	86		67			19
TOTAL	2033	560	195	261	823	194

scattered in other months of the period.

One episode involved three serial days of 80 or more admissions (December, 1957) the largest number of admissions were at a time of calm on the first day of that series and on the second and third days during a wind direction in the quadrant South - Southeast through Southwest.

There were three episodes in which two serial days were involved (August and October, 1958) and in each episode both days agreed as to the wind direction of greatest influence.

As mentioned earlier, the relationship between the weather bureau summary of daily wind direction (recorded prevailing wind) and the number of admissions per day appears tenuous. One reason may be due to the rules which define "prevailing wind" in the bureau's language summarizing a 24-hour period.

The tables above are a first attempt to analyze these relationships in detail, especially with respect to the current wind activity. It should be understood that since a variable length of time is involved in the period between onset of symptoms and arrival at the hospital for admission, that this presentation is also fraught with error due to the opportunity for change in wind direction between time of onset and time of admission. The period of time between onset of symptoms and the attack leading to admission at the hospital is quite variable. From the tentative information available on this topic the period between onset and admission seems to be an average of between 3 and 6 hours. Secondly, for unknown reasons, admissions occur more often in the evening than in other periods of the day.

The third method of analysis (and the one which appears satisfactory in the absence of information about time of onset) depends upon a redefinition of "prevailing" wind direction, to allow classification to include "calm" and "variable" as specific conditions.

For the purpose of this study, "predominant" wind direction is defined as follows:

Each day is classified according to the single (4-point) direction most often observed in the 24 observations, or to "calm" if that observation was made more often than any other, or to "two or more directions" if an equal number of hourly observations were made for more than one direction.

Since the original directional observations are made on a 16-point compass as Moissant Airport, the category "North" thus includes the quadrant from North - Northwest through North - East, and so forth around the compass.

Table 2-II-12 shows the average daily admission rate for days classified according to predominant direction and average wind speed. From this table it appears that there is a relationship between the admissions per day, wind speed,and direction.

There is evidence that predominating North and East winds have little effect in producing emergency asthma cases, and might even have some effect in preventing them. Days of predominantly West wind have a mean admission rate of approximately the same as the average for all days. (35 admissions per day). Predominantly South wind, and days with no predominant direction, appear related to higher admission rates. Further, this relation appears to be influenced considerably by the "ventilation" over the city on the day at question. *

Table 2-II-13 relates region and wind direction according to season, showing admission rates per 10,000 person-days of experience among known Negro "susceptibles". *

A "region" is a group of census tracts occupying, roughly, a rectangular segment of the city. The regions were created by laying a rectangular overlay over a census tract map of New Orleans. Region

---

* As determined by the crude method of obtaining "number of individuals."

Table 2-II-12

Mean and Variance for Daily Admissions Categorized According to Average Daily Wind Speed and Wind Direction

Predominant Wind Direction	0 thru 6	7 thru 9	10 thru 19	Total All Speeds
No Predominant Wind Calm $\bar{x}$ ~~(admission)~~	63.0	–	–	63.0
$S_{\bar{x}}$	24.0			24.0
2 or more directions $\bar{x}$	39.5	36.8	29.8	38.6
$S_{\bar{x}}$	2.4	3.0	3.6	1.9
North thru Northwest $\bar{x}$	29.2	29.0	30.6	29.6
$S_{\bar{x}}$	2.0	1.5	1.7	1.0
East thru Southeast $\bar{x}$	32.4	28.1	27.1	29.1
$S_{\bar{x}}$	3.3	2.1	2.7	1.5
South thru Southwest $\bar{x}$	47.6	37.7	28.0	40.4
$S_{\bar{x}}$	3.5	3.0	3.4	2.2
West thru Northwest $\bar{x}$	38.7	34.8	38.1	36.7
$S_{\bar{x}}$	39.3	3.6	2.6	2.1
Total all directions				35.3
				1.9

Table 2-II-13

Admission Rates per 10,000 Person - Days of Experience Among Colored Known "Susceptibles" (Multiple Daily Admissions Included) According to Predominant Wind for the Day of Admission

Region	N through NE		E through SE		S through SW		W through NW		Variable	
	Dec.-May	June-Sept.	Dec.-May	June-Sept.	Dec.-May	June-Sept.	Dec.-May	June-Sept.	Dec.-May	June-Sept.
11	20	36	67	31	149	93	82	0	145	106
12	86	133	147	111	213	185	133	141	181	196
13	43	72	77	58	153	101	64	38	120	116
14	-	-	-	-	-	-	-	-	-	-
21	47	84	73	58	105	85	83	71	167	64
22	80	91	127	81	175	121	160	87	151	118
23	50	55	98	65	132	92	113	33	108	89
24	72	27	65	48	92	49	119	44	71	60
32	49	40	54	75	115	111	51	109	138	60
33	42	60	70	60	84	75	70	68	83	86
34	11	80	74	34	112	68	61	49	27	110
42	33	0	82	113	104	192	69	98	80	96
43	13	34	16	33	30	65	24	9	26	92
44	40	48	44	26	86	50	122	67	61	14

$$X = \frac{10,000}{n\ K}$$

K = no. known reactors in region
n = no. of days in given category of season, wind direction
x_i = no. of admissions in day (i)

1 - 4 (extreme north - west area) has a very small Negro population, and practically no reported emergency asthma admissions. Regions 3 - 4 and 4 - 1 are not in the city.

For the period June 1 through September 30, South and Southwest winds were predominant in relation to admission rates, in nearly every region. The rates were highest in the southwest area of the city, and showed a pattern of gradual reduction of the South wind rates as one's attention moves northeast across the city. (Figures 21 and 22). The two regions in the far northeast corner did not have south-predominant admission rates.

For the period December 1 through May 31, the rates per region were generally higher, the South and South-west wind pattern was approximately the same, in being associated with high rates near the southwest corner of the city and reducing as one's attention moves to the north and east. A point of difference between the two periods June through September versus December through May, however, is apparent in the influence of variable winds. For the period June 1 through September 1, eight of the 13 regions have the highest admission rates attributed to "variable" days, while for the period December through May only two of the 13 regions had their highest rates for variable days. Days of wind direction south, and variable days tend to have highest rates near the river. Regions near the river (south part of the city) have comparatively higher rates for west, south and east in the winter period.

Table 2-II-14 compares age-specific daily admissions by duration of the South wind for the city as a whole. Referring back to the topic of discussion raised by Table 2-II-1, there appears to be no evidence of South wind effect for younger persons, while for persons aged 35 or over there appears to be evidence of effect of South wind influencing the daily admission rates. Secondly, although there are higher means for the 0 through 34 age group in the December through May period,

Figure 21

Map of Census Regions, N.O. showing Admission Rates per 10,000 Person-days of Experience among Colored Known "Susceptible" persons (Multiple Daily Admissions Included) According to Prevailing Wind for the Day of Admission Period December 1,1957 through May 31,1958

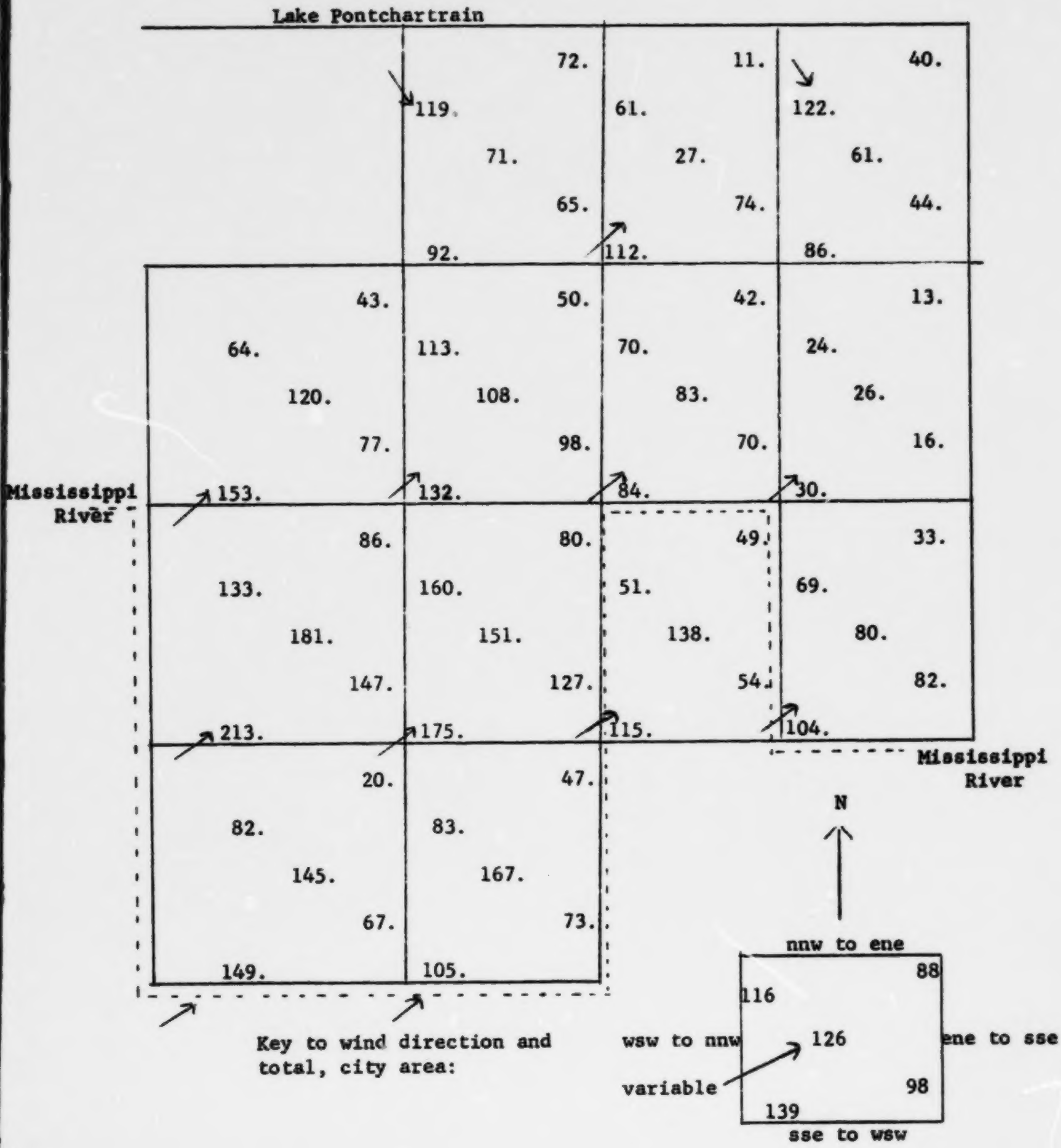

Figure 22

Map of Census Regions, N.O. Showing Admission Rates for 10,000 Person-days of Experience among Colored Known "Susceptible" Persons (Multiple Daily Admissions Included) According to Prevailing Wind for the Day of Admission Period June 1,1958 through September 30,1958

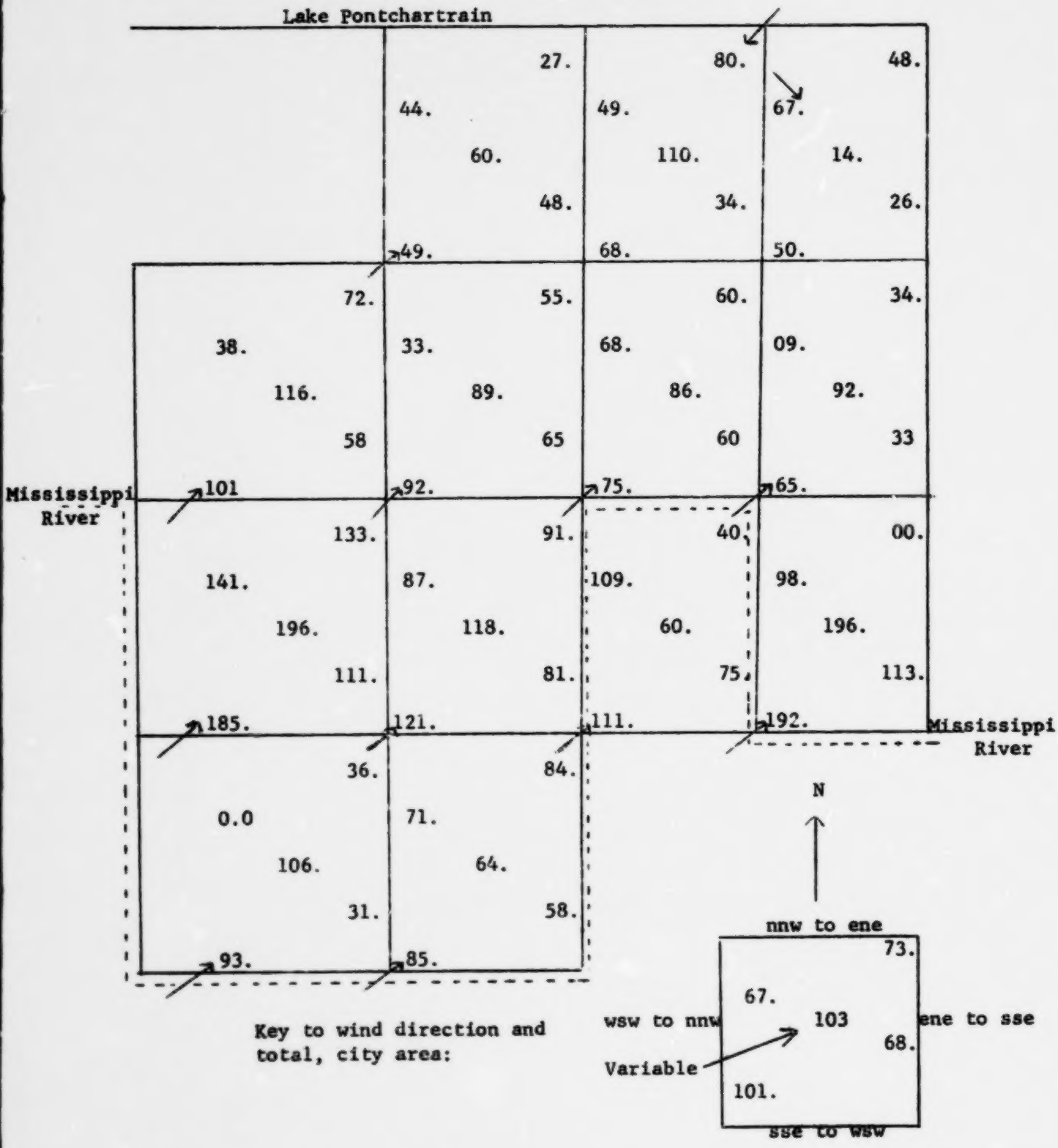

Table 2-II-14

Colored Daily Admissions by Age and Duration of the South Wind

	MEANS		**VARIANCES**			
	December through May	June through Sept.	December through May		June through Sept.	
0-9 Age Group			# of Days		# of Days	
No South Wind	5.1	3.1	70	8.2	16	3.9
South Wind 0-3 Hrs.	4.0	2.5	34	6.4	19	5.8
4-8	5.4	2.4	35	6.2	32	1.6
9-14	4.7	2.5	29	6.5	27	3.9
15	4.7	2.9	18	6.2	28	4.1
10-34 Age Group						
No South Wind	15.5	8.7		28.3		30.0
South Wind 0-3 Hrs.	14.6	6.8		39.0		11.8
4-8 Hrs.	16.5	8.5		57.8		11.7
9-14	17.0	10.0		64.8		10.0
15	14.8	9.9		33.7		12.9
35-59 Age Group						
No South Wind	10.7	9.0		12.1		28.6
South Wind 0-3 Hrs.	12.2	9.9		25.8		16.8
4-8	13.7	14.2		32.1		68.4
9-14	15.8	15.5		78.9		58.9
15	16.2	17.4		71.2		68.7
60 ≠ Age Group						
No South Wind	3.9	3.8		2.9		8.6
South Wind 0-3 Hrs.	4.6	2.9		3.3		2.1
4-8	4.7	5.9		6.0		15.0
9-14	5.8	6.1		8.8		10.5
15	7.0	7.7		11.1		21.0

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the means are approximately the same for both periods in persons aged 35 or over.

CLOUD COVER

"Total sky cover" refers to the proportion of visible sky which is obscured by clouds at the time of observation.

Approximately half of the admissions were at a time when partial cloud cover existed. Approximately one-fourth of the admissions occurred while the sky was totally covered and approximately one-fourth occurred when the sky was clear of clouds.

Table 2-II-15 shows the two extremes of cloud cover, 0 to 20% and 80 to 100% cloud cover, during the hour prior to admission, for admissions classified according to the total number of admissions on the day concerned. Chi-square analysis of the table indicates a relationship between sky cover and the total number of admissions per day with an excess of admissions occurring on days commonly classified as "outbreak" days with very light sky cover of clouds. The next heaviest contribution to the chi-square value was in the same category of type of day, with apparently too few admissions when the sky was heavily clouded over.

As mentioned above in discussion of wind direction at time of admission, this method of analysis may produce erroneous conclusions by relating meteorologic effects to time of admission rather than time of onset of symptoms.

PRECIPITATION

Over 90% of the total admissions occurred at a time when no precipitation was occurring. Since this percentage is also probably approximately true for the event of precipitation in the Orleans area, the data are felt inadequate to divulge relationships between rain and admissions for asthma emergency at Charity Hospital, other than to

Table 2-II-15

Total admissions for Selected* Percents of Sky Cover at Time of Admission According to Total Number of Admissions in Day

Total Number of admissions on day concerned	Percent sky cover at time of admission		
	0 to 25 %	75 to 100 %	Total
0 - 39	1505	2162	3667
40 - 59	2675	3279	5954
60 +	2251	1822	4073
Total	6431	7263	13,694

* About 20 % of admission occurred at time of 25 to 75 % cloud cover and are neglected in the table

indicate that the cases do not unanimously select rainy or non-rainy occasions upon which to occur.

SMOKE AND HAZE

Similar comments to those relating to precipitation are appropriate to "obstructions to vision". More than 90% of the admissions occurred at a time when no obstruction to vision was observed at Moisant Airport. About all that can be said is that the cases did not unanimously select the occasion of smoke or haze (or the lack of same) in the atmosphere ten miles west of town, to come to the hospital.

The "humidity" hourly record was found to be very consistent in a wide regular pattern of diurnal variation. Review of this topic has been incompletely carried out, but from an informal comparison of hourly records of humidity for days with known high rates no obvious relationship was observed.

Chapter 2, Section III.

Summary of outbreaks occurring between December 1957 and November 1958

Eleven outbreaks were selected for special study out of the period of the general retrospective analysis. The episodes were selected on the basis of high daily incidence and were chosen in part to obtain representation of the several seasons of that year. Each episode involved periods of time up to 10 days, depending upon the nature of the outbreaks.

The typical daily incidence curve involves one or two days of approximately average admissions prior to the "outbreak" and then a single modal day followed by from two to five days for which the daily number of admissions is somewhat above the pre-modal period, and returning to approximately average.

When reviewed in terms of the number of first admissions during the period, the daily incidence pattern is essentially the same excepting that the post-modal period shows incidence consistently lower than the pre-modal period. The curves for daily admission rate for the 11 outbreaks are consistent in shape.

Table 2-III-1 shows the age group distribution of first admissions in the eleven episodes. The over-all age group distribution shows 56 per cent involvement of persons over age 30. However, the outbreak of December 8, 1957 has clearly an excess of persons in the 0 through 29 age group. The outbreaks of July 17 and of August 22 have an excess of persons aged over 30 years as compared to the age distribution of all episodes taken together. There are no obvious differences in the distribution by day for the peculiar episodes.

"ATTACK RATES" BY REGION OF THE CITY

In eight of the eleven outbreak periods there appeared to be a gradation of region-specific attack rates as computed on the basis of known

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Table 2-III-1

Age Group Distributions of First Admissions in Period by Outbreak For Colored New Orleans Residents Showing Temporal Details

Period of Episode Begin	End	Number Days	Date of Modal Day	Total First Admissions (Entire Period)	Percent Distribution by Age 0 - 29 First Admission	Per-Cent	30 + First Admission	Per-Cent	Major Contributions to χ^2
Total		86		2362	1036	44.	1326	56.	
12-6-57	thru 12-15	10	12-8-57	335	181	54.	154	46.	----excess of young
1-29-58	thru 2-1	4	1-30-58	139	62	45.	77	55.	
4-17	thru 4-24	8	4-18	212	104	49.	108	51.	
5-3	thru 5-10	8	5-8	235	121	51.	114	49.	
5-20	thru 6-5	10	5-28	275	114	41.	161	59.	
6-24	thru 6-30	7	6-26	152	61	40.	91	60.	
7-16	thru 7-24	9	7-17	197	61	31.	136	69.	----excess of aged
8-3	thru 8-9	7	8-7	149	56	38.	93	62.	
8-17	thru 8-25	9	8-22	199	60	30.	139	70.	----excess of aged
9-28	thru 10-2	5	9-30	163	83	51.	80	49.	
10-17	thru 10-25	9	10-21	306	133	43.	173	57.	

"susceptibles". * In six of the eight episodes in which there appeared to be gradation, the general direction of the degradation matched the direction of wind flow on the modal day.

For the three outbreak periods in which no obvious gradation was observable,the wind pattern on the modal day was light and variable, according to detailed analysis of hourly weather observations at Moisant Airport.

All three outbreaks termed "peculiar" due to age-group distribution were oriented to wind direction by their regional pattern attack rates.

Table 2-III-2 shows the attack rates by this crude method of estimation, for the several outbreaks. By general inspection it appears that most regions are involved in one or another outbreak period, but that quite singularly region 4-3, with 716 potential admissions, was consistently low in outbreak periods for these chosen outbreaks. Region 4-3 is east of the city beyond the Industrial Canal. There are several industries in the immediate vicinity; the housing is generally marginal in nature.

Region 3-2 (across the river from the city proper) was involved in nine of the eleven outbreaks. However, only in the outbreaks of April 18 and August 7 did that region have attack rates greater than 12 per cent.

Region 1-2 was involved in all the outbreaks and its attack rates were among the highest for any given outbreak, even for those episodes where there was no relation between wind direction and the direction of gradation of the attack rates.

Although region 1-1 is usually involved among the eleven episodes under study, the attack rates are generally less severe than are those of its neighbors to the north and northeast (regions 1-2 and 2-2).

Summarizing the eight outbreaks in which there was directional reduction in the attack rates, that reduction was generally from the

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* The number of known "susceptibles" is calculated on the basis of regional identification of individuals according to the technique shown in Chapter 2, Section II.

Table 2-III-2

Number of Admissions per 100 Known "Susceptibles" for Eleven Outbreaks by Region, Showing Number of Susceptibles and Predominant Wind Direction on the Modal Day

		Modal Day of Outbreak										
Region	Number of Susceptibles	12-8 -57	1-30 -58	4-18	5-8	5-28	6-26	7-17	8-7	8-22	9-30	10-2
11	75	9.3	9.3	8.0	12.0	10.6	13.3	8.0	6.7	10.6	8.0	14.7
12	236	19.5	7.2	14.8	19.9	19.9	12.7	14.4	16.5	23.7	12.7	24.2
13	133	9.8	1.5	12.0	8.3	27.8	6.8	9.8	6.8	9.8	7.5	12.8
14	5	-	-	-	-	20.0	-	-	20.0	-	-	-
21	307	14.3	2.9	9.1	5.2	10.4	6.5	6,8	4.9	12.1	6.5	8.5
22	1280	22.0	7.2	11.6	10.3	16.6	8.4	13.0	7.5	12.3	5.8	15.8
23	658	15.7	4.3	6.5	8.8	15.5	5.6	10.8	5.3	6.2	4.6	13.1
24	153	9.2	4.6	10.5	10.5	11.8	2.6	7.8	6.5	3.3	5.9	11.1
32	46	4.3	0.0	17.4	10.9	4.3	4.3	10.9	15.2	0.0	0.0	4.3
33	617	12.7	5.0	6.0	6.0	10.7	6.3	7.9	3.4	6.0	7.0	13.3
34	34	11.8	5.9	8.8	14.7	2.9	2.9	8.8	2.9	11.8	0.0	0.0
42	17	-	-	-	41.1	5.9	-	11.8	17.6	29.4	-	-
43	716	3.9	0.6	2.0	3.2	2.5	1.0	1.5	0.4	1.1	2.0	1.0
44	75	12.0	1.3	9.3	17.3	17.3	0.0	1.3	4.0	5.3	6.7	13.3
Wind direction*		CWSW	S	WNWS	ECES	SWNSV	SWSC	V	V	V	SV	SV
Wind speed (range)		0-15	4-11	5-8	0-12	3-8	0-11	4-9	0-8	3-12	5-9	1-10

* Shown in order of occurrence: predominant condition underlined.
C = calm, V = variable directions of short duration

southwest to northeast involving regions 1-2, 2-2, 2-3 and 3-3.

Region 4-4, although in the directional pattern suggested in the last paragraph does not appear to reflect the same experience. Region 4-4 lies to the northeast from the city proper and between that region and the city there lies an industrial complex along the Industrial Canal.

The occasional high attack rates in region 4-4 tend to confirm the implication reached from data of the general retrospective study, that some effective air contaminant is emanating from the area along the Industrial Canal. The general pattern of differences in regional rates also confirms the suspicion of a contaminant source near the Mississippi River on its southward course, west of the city proper.

The high number of persons (716) admitted from region 4-3 remains unexplained by this selection of outbreaks.

Surveillance of hospital admissions - 1959

COMPARISON OF ASTHMA ADMISSIONS, 1958 vs. 1959

In the retrospective study of the cases from the period December 1, 1957 through December 30, 1958 the average number of admissions per day was approximately 35 in the Negro Center for persons aged 12 or over. For the period December 1, 1958 through November 30, 1959 the average number of admissions was approximately 20 per day. On no day were there less than 5 admissions in the two year period.

after our visit 6/8 1958

Figure 31 shows the frequency distribution of admissions per day in the Negro clinic for the period December 1, 1957 - November 30, 1958 and for the period December 1, 1958 - November 30, 1959. The curves are drawn free hand through the scatter of points in order to give a visual impression of the variation in the total number of admissions per day. The curve for the first period is considerably more skewed to the right than the curve for the second.

The conclusion to be drawn from comparison of daily admissions for the two periods is that the experience in 1959 was, in some way, radically different from that in 1958.

* medication!

The two frequency distributions have one characteristic in common; that the minimum number of admissions per day lie between 5 and 10 cases for both periods. The observation may be interpreted as evidence that a daily base of cases exists, perhaps among that group with many admissions per year, which would account for - say - from 5 to 20 admissions per day. The episodes of etiologically related asthma may occur over and above this base.

Figure 32 shows the average daily admissions per month in the Negro Emergency Center over the two year period, showing the mean for the period 1958 and for 1959. In explanation of Figure 3-1, the

FIGURE 31

Frequency Distribution of Admissions per Day for Acute Respiratory Embarrassment (Asthma) at Charity Hospital Negro Emergency Center for Persons Aged 12 Years or Over.

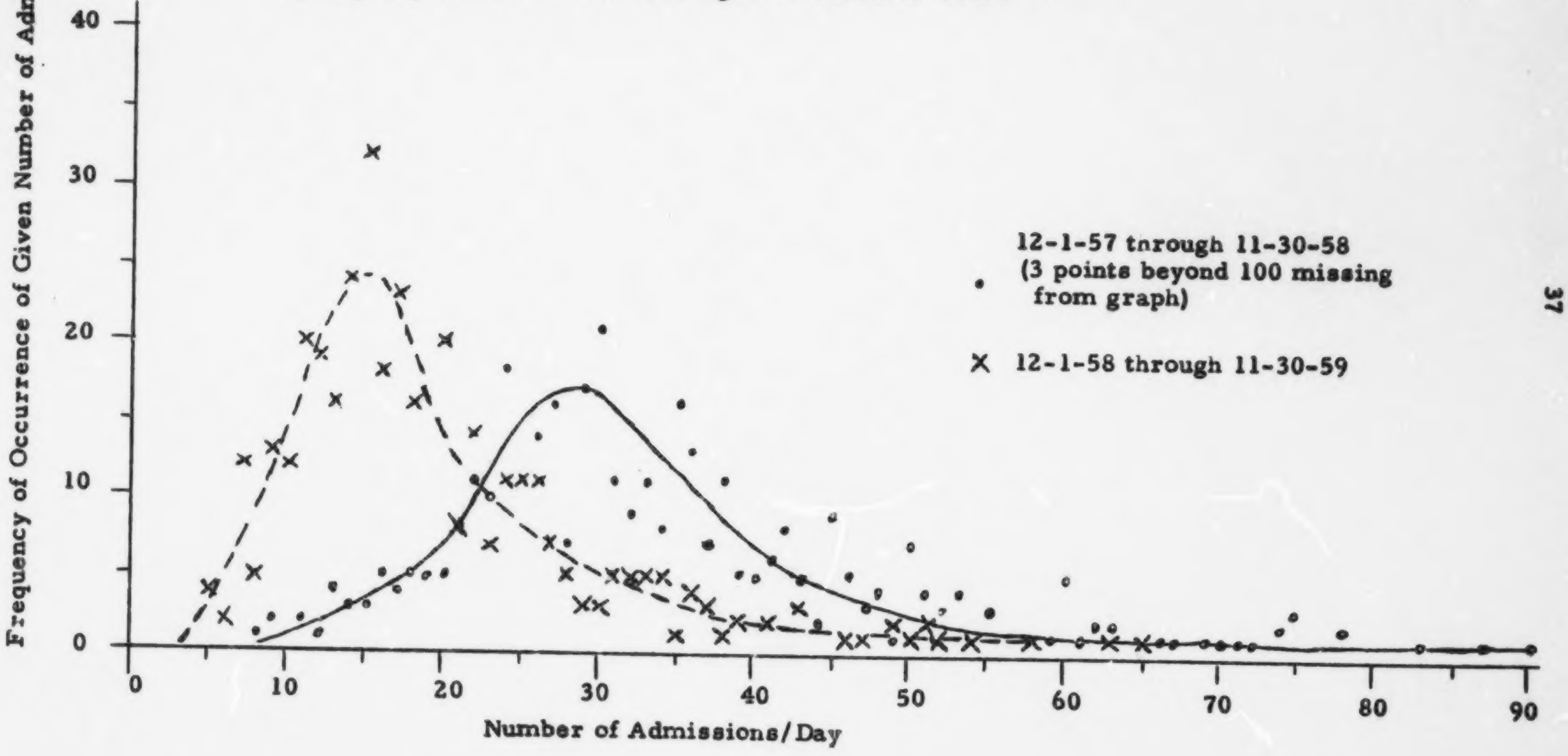
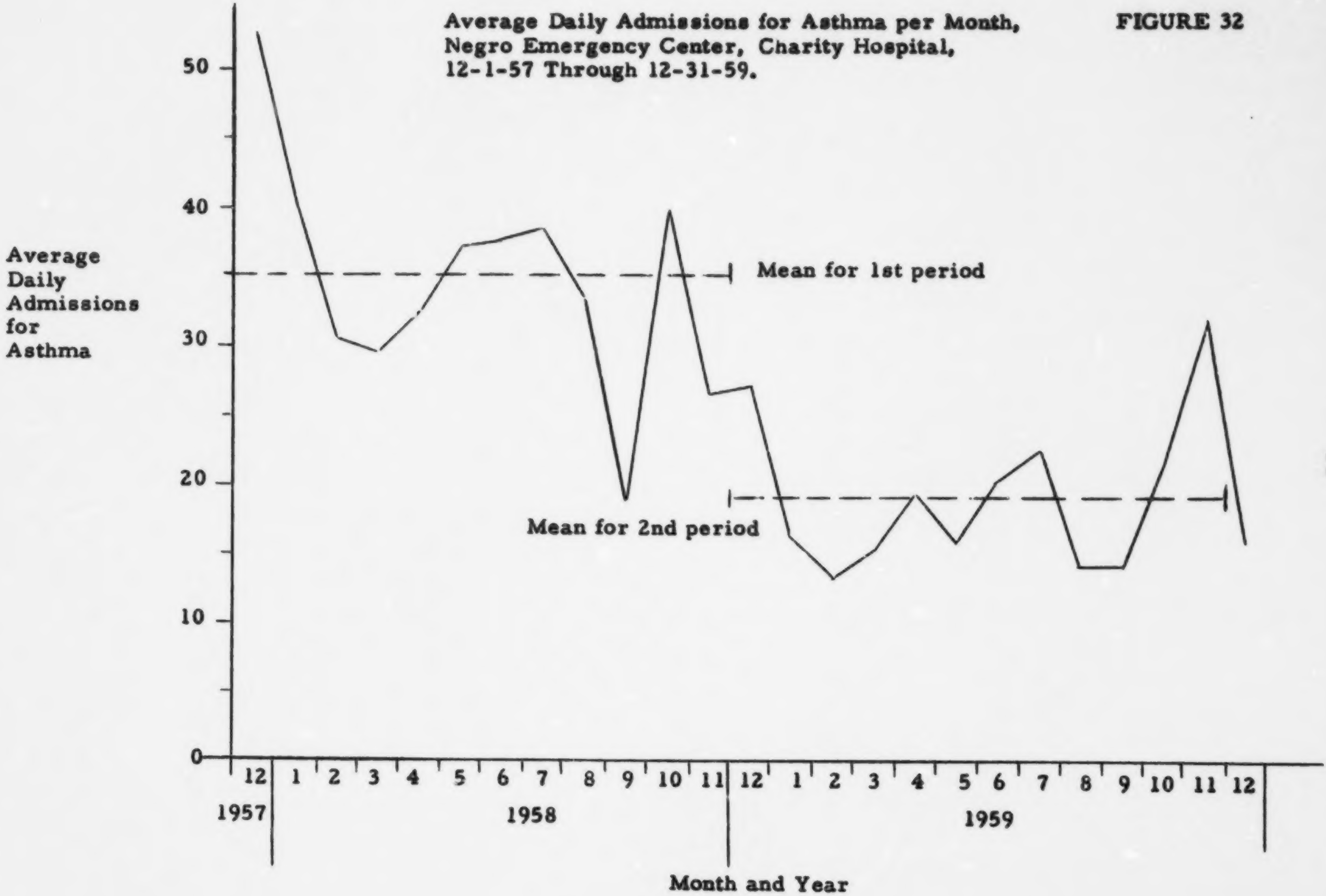


FIGURE 32

Average Daily Admissions for Asthma per Month, Negro Emergency Center, Charity Hospital, 12-1-57 Through 12-31-59.



points on the far left of the distribution for the first period represent daily incidence during the month of September 1958. The points on the far right of the distribution for the second period represent daily incidence during the months of October, November, 1959.

PREVAILING WIND DIRECTION

Table 2-II-6 shows daily asthma admissions in the Negro Center according to "prevailing" wind as published by the U. S. Weather Bureau, for the period December 1958 through November 1959.

Table 2-II-7 shows daily admission rates according to wind direction. That table appears to show that in 1959 there was little if any Southwest wind effect, as compared to great effect in 1958. However, Table 2-II-9 indicates that for 1959, as for 1958 (mentioned previously regarding the 1958 period) most if not all the apparent effect might be related to differences in period of exposure.

Other evidence shown in Chapter 2, Section II indicates Southwest wind involvement in increased admissions; however, the 1959 period had approximately twice the duration of Southwest wind exposure than occurred in the 1958 period.

Mention has also been made of the apparent "deterrent" effect of Southeast and East winds appearing in data for the 1958 period. Yet the 1958 period experienced about twice as many such days as the 1959 period. The effect of wind speed and overcast (as two other apparently related variables) is unknown for the 1959 period, and may be very important in explaining the disagreement in evidence.

The only information available for the entire second period comes from a daily log of the number of admissions and from Monthly Summaries of Weather Records. No information is available for the second period about age, race, sex, or other personal or geographic characteristics.

doesn't use the standard Durham apparatus ??

POLLEN AND MOLD

For the period from March through December 1959, information has been made available about pollen counts (trees, grass and ragweed) and mold counts from Dr. Wallace Ruben of New Orleans. Dr. Ruben has used the petrolatum slide technique daily throughout that period and has kindly made his data available. The petrolatum slide test technique is such that more than a trace of rain is sufficient to negate the effectiveness of the count for a day.

Table 3-I-1 summarizes the results of Dr. Ruben's count (in half month intervals) showing the number of days for which observations were possible. Although January and February are missing from the available information, it appears that the pollen count for trees is beginning to rise in December after being negative for four months, that some mold count should begin to be seen in January or February, that grass pollen will be minimum, and that ragweed will be negative for the missing months.

The few days of "high" admission in 1959 included one day in March, one day in July, one day in October, two days in November. There is no apparent coincidence with trees or mold or ragweed, but the three outbreaks in October, November coincide with an increase in grass pollen.

DETAILED INFORMATION, ADMISSIONS IN 1959

Personal Characteristics

After June 1, 1959, a surveillance team was established from whose efforts information is available from interview records of a few cases per week from the 1st of June through the 1st of December 1959. These data do not constitute a representative sample because of bias arising from the selection of patients (convenience of the interviewing person).

Table 3-I-1

Pollen Count per day for Observed Days in Given Calendar Periods

By Type of Pollen*
(Note that rain prevents counting)

(1959)		Observed days (total)	Pollen per day			
			Trees	Mold	Grass	Ragweed
March	1-15	3	343.	12.	0.	0.
	16-31	11	227.	11.	2.	0.
April	1-15	9	133.	21.	6.	0.
	16-30	8	20.	22.	5.	0.
May	1-15	11	9.	14.	5.	0.
	16-31	7	4.	10.	5.	0.
June	1-15	4	2.	9.	4.	0.
	16-30	8	2.	10.	0.	0.
July	1-15	6	2.	14.	0.	0.
	16-31	5	1.	7.	1.	1.
August	1-15	9	0.	6.	1.	2.
	16-31	6	0.	8.	0.	2.
Sept.	1-15	8	0.	11.	1.	29.
	16-30	10	0.	3.	2.	67.
Oct.	1-15	7	0.	3.	8.	43.
	16-31	7	0.	0.	10.	13.
Nov.	1-15	11	0.	0.	13.	7.
	16-30	7	0.	0.	11.	3.
Dec.	1-15	9	1.	0.	4.	0.
	16-31	9	4.	0.	7.	0.

* Data are by courtesy of Dr. Wallace Rubin, using the petrolatum slide method in New Orleans, Louisiana.

On the first of June, 1959 Dr. Povilas Vitenas joined the staff under a Public Health Service student research fellowship. Dr. Vitenas began work on the problem of the cytology of sputum from acute cases of asthma and in the course of his work, there was begun a practice of weekly interviews of persons who had reported to the Emergency Center for treatment for emergency asthma.

The hospital interview record is shown as Appendix C and provides the source for the following information about personal and temporal characteristics of routine emergency asthma admissions during 1959.

Table 3-I-2 shows the age group distribution for the 164 persons interviewed in the period from June through November. The age group distribution does not appear to be significantly different from that of patients admitted for asthma in 1958.

There were very few observations made in August and September, due in part to the paucity of admissions during that period and in part to a concern for other affairs on the part of the project personnel. About the middle of October a clerk was hired to perform the duties of interviewing and to collect sputum. Prior to that time nearly all the specimens and interviews were obtained during the evening, at the convenience of the physicians involved. After about the middle of October routine interviews were obtained during the period between 10:00 A. M. and 5:30 P. M. in the afternoon.

Table 3-I-3 shows age by "season" of admission for the 164 non-outbreak emergency asthma admissions. For the persons interviewed, there appears to be a slight excess for older persons in the summer period, which is in keeping with results shown for the 1958 period.

Table 3-I-4 shows results for 125 individuals (for whom information was available) about the duration of asthma attacks in their lifetime. The table shows the age-group distribution for persons with a

TABLE 3-I-2

Age by Month of Admission for 164 "Non-outbreak"
Emergency Asthma Admissions (not total admissions)
in Negro Adult Emergency Center

Month of Admission	Age at time of admission							
	Total	12-19	20-29	30-39	40-49	50-59	60 +	Unknown
Total	164	18	28	26	23	31	35	3
June	32	3	6	6	6	4	6	1
July	54	3	7	10	7	11	15	1
August	7	1	0	3	0	3	0	0
Sept.	4	0	1	0	0	1	2	0
Oct.	29	5	5	4	2	6	6	1
Nov.	38	6	9	3	8	6	6	0

TABLE 3-I-3

Age by "Season" of Admissions for 164 "Non-outbreak"
Emergency Asthma Admissions

Month of Admission	Total	12-29	30 +	Unknown
Total	164	72	89	3
June - Aug.	91	39	92	2
Sept. - Nov.	70	33	37	1

TABLE 3-I-4

Current Age by History of Asthma Attacks for 125 "Non-outbreak" Individuals, for Whom the Information is Available

Duration in lifetime to date of interview	Total	Age at time of interview			
		12-19	20-39	40-59	60 +
Total	125	18	43	42	22
Less than half of lifetime	63	3	20	24	16
More than half of lifetime	62	19	23	18	6

history of asthma attacks for less than half their life-time to date compared with the group with a history of asthmatic attacks extending for more than half their lifetime. Approximately half of the 125 persons for whom information was available reported that the onset of asthma attacks occurred during the last half of their life. More younger persons had onset in the last half of their lifetime.

Further information about this group are included in sections below on sputum cytology and the outbreaks of 1959.

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STUDY OF SPUTUM CYTOLOGY

A study of sputum cytology was undertaken to detect, if possible, differences in cytology with respect to personal characteristics and to differentiate seasonal or outbreak characteristics if they exist. The primary phase of the study of sputum cytology was concerned with finding reliable methods of staining and reporting the cytologic characteristics.

The present study includes individuals seeking relief from asthmatic attacks in the Emergency Center of Charity Hospital, New Orleans, Louisiana.

Information about personal characteristics (Appendix C: Hospital Interview Record) and the sputum specimen, (Appendix E: Sputum Cytology Record) were obtained from not all, but for each week a few, of the admissions from June 1 through November, 1959. Usually one or two specimens were collected each day during the week. During the period from June 1 through August 15 the specimens were generally collected in the evening -- from September through November, the specimens were collected during the day, on Monday through Friday only.

The daily average of emergency admissions was less than 20 acute asthmatics per day during the period of the study. 200 persons were interviewed and 153 specimens were collected from those able to bring up sputum. All patients received emergency treatment prior to interview and sputum collection. Some patients obtained complete relief with no productive cough or sputum and an absence of asthmatic breath sounds, but most had symptoms after treatment for varying periods of time. ||×

The sputum was obtained by a distinct explosive cough, projecting the material directly into a wide-mouth bottle. By this method a minimum contamination with saliva resulted.

All specimens were digested, fixed and stained as soon as possible. Some were fixed immediately, while others were refrigerated for as long as 10 hours after collection. No cellular disintegration was observed. Sputum specimens were differentiated macroscopically into the following 3 categories:

1. Thin mucoid
2. Tenacious and Gelatinous mucoid
3. Muco-purulent and Purulent

Muco-purulent sputum can be of two types, one predominantly purulent and others mucoid with cellular elements varying accordingly. Speaking in general, the different cellular elements are irregularly distributed in sputum with clumping in discrete areas and with other areas devoid of cells. For this reason the examination of a single direct film is apparently of little value in cytologic differentiation.

SELECTION OF FIXING AND STAINING METHOD

Several methods were explored by which to homogenize the sputum in order to obtain an even suspension of preserved cells prior to fixing and staining the slide.

One satisfactory enzyme for this purpose is trypsin, which appears to liquify all types of sputum without digesting viable cells or effecting the viability of bacteria. However, trypsin may reduce the number of non-viable epithelial cells present.

Other enzymes used were ficin and papain. Both require an activator, cyctine. Digestion by these enzymes could not be as easily controlled. Further, a residual film obscures the cellular detail. Other agents used were lysozyme, hyaluronidase, streptokinase, and streptodonase. Mechanical homogenization and chemical methods were not attempted.

The specimen is digested with equal parts of freshly prepared 1 per cent trypsin solution in a phosphate buffer at pH 7.4 at room temperature until the sputum is liquified. Thin mucoid sputum is adquately digested within 30 minutes, but thick mucoid or purulent sputum may require over 50 minutes, with agitation, to liquefy. However, this process could be greatly accelerated by heating the mixture to 40°C.

A camel's hair brush is used to make direct and digested sputum smears. The brush produces a thin even film which proved to be superior to other methods such as cotton applicator, wire loop and two-slide technics. A commercial albumen was tried, to inhibit further digestion and to facilitate fixation; however, the cells did not stain properly, and the use of albumen was discontinued. In either Schaudinn's or Bodin's solution, the smear could be fixed by air dried or wet, although air dried films appeared to be superior.

The cytoplasm and nucleus of all cells in sputum, especially eosinophils and polymorphonuclear leucocytes, must be fixed and stained faultlessly to be clearly differentiable. The three fixatives that appear to meet all requirements are Schaudinn's (mercuric chloride) Bodin's (picric acid) and ether-alcohol solutions, although films fixed by Schaudinn's solution appear to have a clearer cytoplasm and more distinct eosinophilic granules.

The Papanicolaou method is better used for staining the nuclei of malignant cells than for eosinophilic granules. Polychrome stains such as Wright's or Giemsa stains do not produce uniform results in sputum cytology since the eosinophilic granules do not appear clearly and distinctly. Leishmann's stain was also found unsatisfactory.

The chosen method is to fix with Schaudinn's solution and stain with hematoxylin and eosin.

The method of staining is:

1.	Schaudinn's	20-30 minutes
2.	Iodine solution	3-5 minutes
3.	Ether-alcohol solution	30 minutes
4.	95% alcohol solution	1 minute
5.	70% alcohol solution	1 minute
6.	Water	1 minute
7.	Hematoxylin, Harris	2-3 minutes
8.	Water	1 minute
9.	Acid alcohol	Wash
10.	Water	30 seconds
11.	Eosin, 0.5%	2-3 minutes

12.	Water	1 minute
13.	70% alcohol	Wash and rinse
14.	95% alcohol	Wash and rinse
15.	Absolute alcohol	Wash and rinse
16.	Xylol	5 minutes

Dry, add permount and cover glass.

Late in the study period, interest developed in the relationship between blood cytology and sputum cytology in emergency asthma cases. Thin blood smears were obtained from 28 cases at the time a sputum specimen was produced. These were stained by Wright's stain and a differential count was performed.

RESULTS

Since June 1959, 153 specimens were collected from individuals with an acute asthmatic attack in the emergency room of Charity Hospital, New Orleans. Of these specimens 12 were saliva, and 141 contained sputum. As the study developed, all specimens were examined microscopically by direct film and after about the first of October all were examined by trypsin-digested film.

small no.

The trypsin-digested slides showed an even suspension and a differential count could easily be carried out. When fixed with Schaudinn's solution and stained by hematoxylin and eosin, all cellular elements were clear, well-defined and distinct. Epithelial cells were apparently decreased and Charcot-Leyden crystals were digested. The eosinophilic granules appeared pink or red in color, clearly differentiating them from the polymorphonuclear leucocyte.

Other cell types also stained well, including four types of epithelial cells, macrophages, lymphocytes and monocytes; alveolar cells were never observed.

Examination of the gross appearance of sputum as compared to homogenized findings reveals that purulent material contains numerous cells (approximately 30,000 cells per cm.), with predominantly polymorphonuclear leucocytes and has bacteria, especially streptococcus and staphylococcus; fewer cells and bacteria are present in mucopurulent material, the number being dependent on the quantity of pus present.

Thick gelatinous mucoid specimens had fewer cells (approximately 1,500 cells per cm.) with only a few bacteria, many molds, fungi and yeast, such as Aspergillus, Trichophyton, penicillin, and Monilia. Most if not all of the latter are probably from extraneous sources. Thin mucoid sputum contains only a few cells, requiring a large part of the film to be searched to find 100 cells. A few digested mucoid specimens were centrifuged at low speed, cells washed, concentrated and resuspended, thereby concentrating the cells which facilitated differential counts. The specimens were divided by gross appearance into 4 categories (1) thin mucoid, 35 specimens (2) tenacious or gelatinous mucoid, 82 specimens (3) muco-purulent or purulent 25 specimens and (4) saliva, 12 specimens, thus making a total of 154.

Results are shown in Table 3-II-1 by cell type and gross appearance. High cellularity in the film is apparently related to purulent or predominantly purulent sputum, showing an abundance of polymorphonuclear leucocytes with only a few eosinophils and epithelial cells. Mucoid smears, however, contained few cells; some had many eosinophils and others only a few. Epithelial cells, macrophage and other cells were more numerous in mucoid smears, while still others had a predominance of polymorphonuclear leucocytes. Thus mucoid sputum contained a varying percentage of eosinophils varying from less than 10% to 80% in a few instances. Purulent sputum usually only had a few eosinophils.

Mucoid sputum reflects eosinophilia in approximately 50% of such cases, while "purulent" shows eosinophilia in only 5% of cases. Mucoid sputum has a reduced neutrophile count in about half of cases, while "purulent" shows no such shift.

For 116 persons for whom information was obtained about the general history of asthma and for whom sputum specimens were obtained, Table 3-II-2 indicates that approximately one-third of the persons involved had asthma difficulty either all year, or in multiple seasons of the year. For this group and for each group representing a particular season, spring, summer, fall or winter, the distribution of the eosinophile differential in sputum was not apparently different: about half of them had less than 10% eosinophiles in the sputum differential and about half had 10% or more.

Table 3-II-1

Cytologic Differentiation in Percent for Specified Types of Cells

According to the Type of Sputum

		Total Cases	Percent of Cells				
			0-19	20-39	40-59	60-79	80-99
Eosinophiles	Total	142	86	21	19	9	7
	Mucoid	117	63	21	18	8	7
	Purulent	25	23	0	1	1	0
Neutrophiles	Total	142	23	23	19	19	58
	Mucoid	117	22	23	18	19	35
	Purulent	25	1	0	1	0	23
Other	Total	142	94	26	.17	5	0
(lymph,mono, epithelial)	Mucoid	117	69	26	17	5	0
	Purulent	25	25	0	0	0	0

Table 3-II-2

Sputum Eosinophils Differential by Season of Greatest Difficulty for 116 Persons Reporting on General History of Asthma

	Total	Seasons reported related to major asthma trouble					
		All year	Spring	Summer	Fall	Winter	Combination of Season
Eosinophiles							
Total	116	16	11	25	19	23	22
Less than 10 %	60	9	6	12	8	14	11
10 % or more	56	7	5	13	11	9	11

The conclusion is that there is no apparent seasonal pattern for asthma history related to eosinophilia in the sputum, with "eosinophilia" defined for these purposes to be 10 or more per cent cytologic differentiation of eosinophiles. However, it should be remembered that no cases are observed outside the June-November period.

There appears to be no relationship between degree of eosinophilia (as defined for Table 3-II-2) and the time of onset during the day, and there is no apparent relationship between eosinophilia and the type of onset.

Peripheral blood smears were made in 27 emergency asthma cases for which sputum was also obtained. Results of the blood differential according to gross sputum appearance is shown in Table 3-II-3. Blood films related to purulent sputum contained less than 10% blood eosinophils (but with no instance greater than 25%). The percentage of eosinophils in blood appears to show a similar distribution to that found in Table 3-II-1 for sputum cytology, with respect to macroscopic type. Test for independence indicates (on the basis of clinical criteria of 6% or more indicating "eosinophilia" that blood eosinophilia may be related to mucoid but not to purulent sputum.

Two outbreaks of New Orleans asthma occurred on October 26, 1959, and November 19, 1959, with 110 and 56 cases respectively. Seventeen specimens of sputum were collected during the two outbreak periods, and approximately 20% of the patients interviewed were unable to produce sputum for study. Fourteen of the specimens were "mucoid" and three were purulent. Table 3-II-4 shows macroscopic type by percentage of sputum eosinophils for specimens collected during the two outbreak periods. Five specimens had less than 5% eosinophils and the remainder were scattered from 5% to 80%.

The distributions of eosinophile percentages for outbreaks appear not different from the distributions shown for cases occurring during non-outbreak periods. Secondly, in both outbreak and non-outbreak cases the per cent of mucoid sputa remains the same (82%). Information to be developed about the two outbreaks will indicate that these results should not be combined.

Table 3-II-3

27 Asthma Emergency Cases According to Type of Sputum and Percent Eosinophils in Blood Differential

Macroscopic Type of Sputum	Percent Eosinophils in Blood Differential		
	Total	0 - 5	6 +
Total	27	11	16
Mucoid	21	6	15
Purulent	6	5	1

Table 3-II-4

Combined Results, Two Outbreaks, Showing Percentage Eosinophiles by Macroscopic Type of Sputum

	Total	Percent Eosinophils in Sputum				
		0-19	20-39	40-59	60-79	80-99
Total	17	8	4	2	3	0
Mucoid	14	5	4	2	3	0
Purulent	3	3	0	0	0	0

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Chapter 3 - Section III

OUTBREAKS OF ASTHMA IN 1959

In the course of initiating and developing the asthma study in New Orleans, the group anticipated that although a good deal of information could be obtained out of the records of Charity Hospital accident emergency service, first-hand information would be needed regarding certain other topics for which no data were available. The emergency service records the time of admission, name, age, race, sex, and home address of each patient. There is no record about the time of onset of symptoms, kinds of symptoms, definite diagnosis, or environmental and family characteristics.

As the project developed during the first six months, certain of these topics appeared to become major issues, particularly the time of onset. Secondly, interest developed in verifying, if possible, general clinical impressions of relationships between asthma, allergy, age and "eosinophilia."

During June and July plans were made with the Louisiana State Health Department to obtain results of short term periodic air samples from a particulate sampler on the city post office roof, rather than attempt to put the sampler on an alert system. The agreement was made that the sampler would be operated on a 24-hour sample basis during the months of August and September. The practice was discontinued at the end of September so that no information was available for later studies.

From the beginning of the study on January 1, 1959, through October 25th, there were no episodes of increased admission which could definitely be identified as an outbreak situation. Nevertheless, during this period, the project developed a standby staff of public health nurses, developed a hospital interview record, a home interview record (Appendix D) and a plan of action for the investigation of an outbreak when and if it should occur. There were fifteen public health nurses who remained on standby call, under instruction for the interview procedure, from about the first of July up until the time of outbreak on October 26th.

The criteria for an alert from Charity admitting ward was a minimum of ten cases admitted within any sixty-minute period. Experience during the year confirmed the criteria as appropriate.

OUTBREAK OF OCTOBER 26, 1959

At about 8 o'clock in the evening of the 26th, the critical number of cases were admitted; the night supervising nurse of the colored accident emergency service telephoned the staff of the project at their homes, and the staff responded by converging on the accident emergency ward.

Upon arrival, there were twenty-five persons under treatment or awaiting treatment. Review of the admission book showed that the increase in admissions actually started at about 3 o'clock in the afternoon, with a total of about fifty patients already treated for the day. Considering the usual daily pattern (influx of cases later in the evening) the decision was made that the surveillance team be put into action. Accordingly, two of the nurses came to the hospital to help interview and to set up listings of names and addresses for transmittal to the other nurses on standby duty.

The names of all persons admitted for emergency asthma treatment from midnight, October 25th to 5 o'clock in the morning on the 27th were listed, were apportioned according to nursing district, and were thus assigned to a particular nurse on the team. Nearly all nurses involved were members of the New Orleans City Health Department field nursing staff.

By 10 o'clock in the evening of the 28th, the home interviewing task had been completed, with seventy-seven persons interviewed and nineteen persons not interviewed. The address obtained at Charity Hospital is usually obtained from an admissions card, which may be several years old. The most common reason for not interviewing was either "moved, no forwarding address" or "never known at this address." All nineteen were individuals who were not interviewed in the hospital and were therefore admitted prior to about 8 o'clock in the evening.

RESULTS

TIME OF ONSET VERSUS WIND DIRECTION AND WIND SPEED

Of the seventy-seven cases reporting with regard to the time of onset, nine persons reported their symptoms began during the previous three days, eleven persons reported onset between midnight and 8:00 A.M. on the 26th, twelve persons between 8:00 A.M. and 4:00 P.M., thirty-two persons between 4:00 P.M. and midnight, and four persons reported onset of symptoms between midnight and 4 o'clock in the morning on the 27th. Nine of the seventy-seven persons were "unknown" with regard to time of onset. The data are summarized in Table 3-III-1 and shown in relation to wind speed and direction as it developed in time. The period of greatest number of onsets per hour is from 4:00 P.M. to 8:00 P.M. associated with light South wind, but this was not the only period in the day with light Southerly winds.

There was no apparent relationship between time of onset on October 26th, and age, sex, family size, number of rooms, cost of housing, geographic location of the residence, type of symptoms at time of interview or whether there was running water in the residence.

LENGTH OF TIME BETWEEN ONSET AND ADMISSION

The length of time between onset and admission varied from a few minutes to more than a day. Table 3-III-2 shows the distribution of length of time between onset and admission for 45 persons for whom information was available. The mean duration is about 5 1/2 hours. The median is a little less than 5 hours.

Table 3-III-1

Time of Onset by Sex for Outbreak of October 26 showing

Wind Direction and Speed for Same Time Intervals

(Seventy-seven Interviewed Participants)

Reported Hour of Onset of Symptoms

Sex	Total	Oct. 23-25	October 26 M to 4	October 26 4 to 8	October 26 8 to 12	October 26 12 to 4	October 26 4 to 8	October 26 8 to M	October 27th M to 4	October 27th 4+	Hour of Onset Unknown
Total	77	9	4	7	8	5	27	4	4	-	9
Male	36	5	1	5	4	2	11	0	2	-	6
Female	41	4	3	2	4	3	16	4	2	-	3
Wind											
Direction		NNW	S		S		S	S	S	NNW	
Speed		10 plus	7 mph		12 mph		8 mph	11 mph	7 mph	17 mph	

Table 3 - III - 2

Length of Time Between Onset and Admission

Length of Time Between Onset and Admission (Hours)	Total
Total	45
0 - 1	10
2 - 3	12
4 - 5	7
6 - 7	4
8 - 9	4
10 - 11	2
12 - 13	1
14 - 15	0
16 +	5

The variability in length of time between onset and admission for treatment undoubtedly has many contributive sources. From results reported elsewhere, we might consider, on the average, 5 to 20 cases of asthma emergency per day which are not related to etiology, but which might be charged to "incidental" sources such as personal allergy, "spontaneous" neurologic and psychologic sources, and other conditions arising at home or place of work. Some other contributing sources to the variability in length of time are attempts at treatment, reluctance to leave home on the part of patients, and the possibility of disagreement as to what is meant by "onset" by either the interviewer or the interviewee.

Table 3-III-3 shows the age group distribution of 72 asthma admissions to Negro adult emergency center on October 26. The distribution does not appear different from that of non-outbreak periods. (Reference will be made below to other aspects of the table).

GEOGRAPHIC DISTRIBUTION

Figure 33 shows the regional distribution of cases by residence in the city. There are too few cases for detailed comparison of regions, but there appears to be no radical geographic orientation as compared to results for previous outbreaks.

TYPE OF ONSET

Thirty-one participants in the outbreak reported that in general their onsets were gradual in character, thirty-two that their onsets were suddent, while fourteen of the seventy-seven were "unknown" as to type of onset.

There is evidence of a relationship between family size and the type of onset, with more sudden onsets occurring in families of smaller size, and more gradual onsets occurring families of large size. Whether the result is meaningful is left to the reader.

There is no apparent relationship between type of onset and time

Table 3-III-3

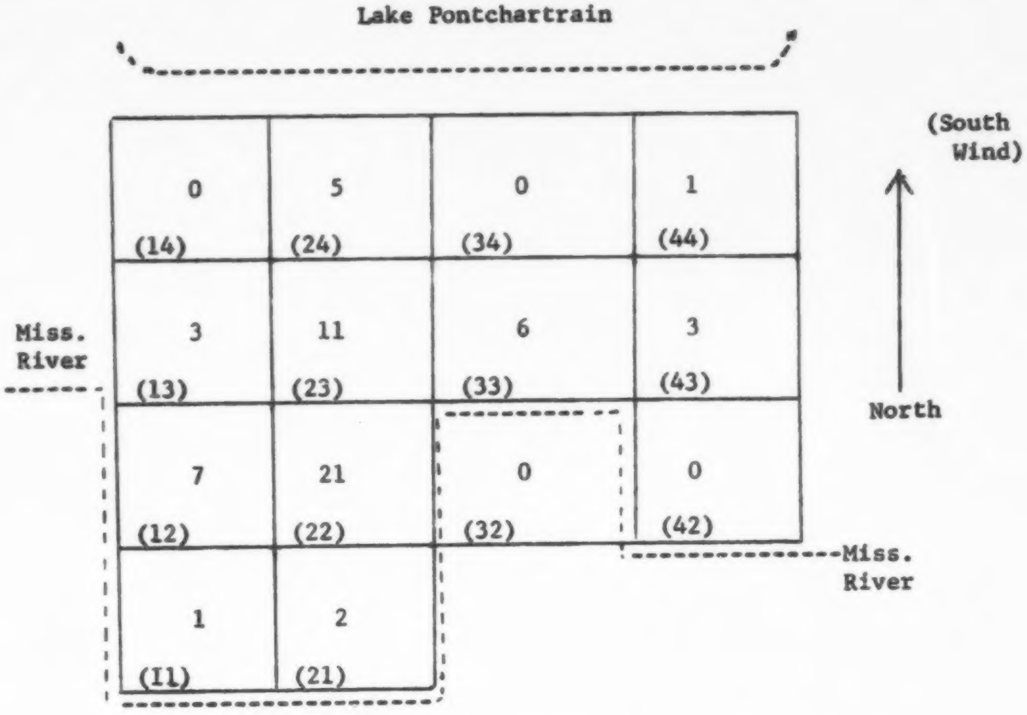
Comparison of Age Distributions for Negro Adult Admissions Charity Emergency Center, for Outbreak and Non-Outbreak Days

1959

	Total	Age at Time of Admission						
		12 -19	20 -29	30 -39	40 -49	50 -59	60 +	Unknown
Non-Outbreak Days								
June Aug.	93	7	13	19	13	18	21	2
Sept. Nov.	71	11	15	7	10	13	14	1
Total	164	18	28	26	23	21	35	3
Outbreak Days								
Oct. 26	72	10	12	9	9	14	14	4
Nov. 19	34	10	12	2	3	4	3	0
Total	106	20	24	11	12	18	17	4
Total All Days	270	38	52	37	35	49	52	7

Figure 33

Regional Distribution of Admissions, October 26, 1959



of onset and no apparent relationship between type of onset and other characteristics such as age, sex, monthly rental, age at which asthma trouble started, or the "usual duration of symptoms" of an attack.

The major point of interest in analysis of "type" of onset has to do with a search for evidence to support or deny ideas of allergenic origin of the asthma trouble since type of onset is routinely included in diagnostic review. The information appears non-committal.

The seventy-seven responding persons were asked about their symptoms at the time of interview (questioning occurred within seventy-two hours of the onset). Symptoms most often mentioned were wheezing, shortness of breath, and cough. There were some fifteen other symptoms mentioned, many of which may be associated with wheezing, shortness of breath, or cough. There is no apparent relationship between sex and type of symptom reported. There may, however, be a relationship between age and the type of symptom; although the differences are not statistically significant, the general implication is that more younger persons report wheezing, more older persons report shortness of breath.

ASTHMA AMONG FAMILY MEMBERS

As part of the interview at home, a family roster was made and for all persons, including the index person, a series of questions were asked about asthma history. In the seventy-seven families for whom there was respondent, there were a total of 103 individuals with history of asthma, seventy-seven participants in this outbreak and twenty-six non participants. There were no apparent differences between the participant group and the non-participants with respect to personal characteristics. Ten per cent of family members (other than participants) reported history of asthma, many reporting they had symptoms on Sunday or Monday, but not of sufficient intensity to warrant emergency center care.

Questions about whether the individual is "now taking medicine", and "when did you last have asthma trouble?" both were interpreted to have inspired misunderstanding on the part of both interviewers and interviewees. Approximately half of the participants and approximately half of the non-participants responded affirmatively to the question about taking medicine. Answers to the question about "last trouble with asthma" produced responses as long as four years ago, but many respondents spoke of the Monday episode, thus invalidating the original intent of the question.

INDUSTRIAL REVIEW

On the day following the outbreak (October 27, 1959), Dr. M. M. Gilkeson, Associate Professor of Chemical Engineering, undertook a field trip in the area to report on current status of industrial air pollution. Dr. Gilkeson reports on visual eminations from industrial sources in the area and brought up to date the listing of types of industries in that area. The report is shown in Appendix F.

VISUAL OBSERVATION OF THE ATMOSPHERE

During the evening of October 26th, there was a light haze lying over the city. Although no observation was made before eight P. M. on the 26th, the humidity was relatively high for the entire afternoon and evening. At approximately 4:00 the next morning, a light drizzle began, which continued for several hours.

OUTBREAK OF NOVEMBER 19, 1959

In the evening of November 16 a dramatic cold front passed the New Orleans area, leaving in its wake a low temperature, brilliantly clear skies and a North-Northwest wind of approximately 20 miles per hour.

From previous experience it had been noted that occasionally the passage of such a front is followed by a gradually diminishing Northerly wind, which in the third or fourth day diminished to approximately zero to be replaced by wind of low velocity from some other quadrant. In the past, some outbreaks seem to have been associated with this phenomena when the replacing wind circulation was directly reversed to the South or Southwest after a period of light or variable Northerly winds.

In early November the Louisiana State Health Department made available a particulate air sampler. This sampler was established under the direction of Dr. M. M. Gilkeson, on the Tulane uptown campus. That location was chosen because the regional distribution of cases seemed to be related more to that area than to the post office building where the State Health Department had the machine previously in operation. Since the machine would not be operated continuously, the aspect of attempting to predict an outbreak occurred. The problem was to get the machine turned on at the time of the onsets of asthma difficulty, rather than to start it after an increase in admissions occurred.

The first attempt at prediction followed the previous front, with sampling started on the 14th of November. The prediction was successful in that a two-fold rise did occur in admissions for the day.

Following the frontal passage of November 16th, a series of telephone calls were made to the New Orleans weather bureau. Predictions from the bureau indicated that on Thursday (the 19th) the wind speed would reduce to zero from the north and might be replaced by an east or southerly direction. Consequent to this advice, the decision was made to start complete interviewing at 10 A. M. The sampler was delayed and began operation at 3:00 P. M. the 19th.

An interesting side light was a telephone call in the early afternoon from Taft Engineering Center. On the basis of information from the meteorology section of the Center, the message was that a "stagnant air mass" had appeared in the central portion of the United States with its limits just north of the New Orleans area and was expected to appear in this area in the evening of the 19th.

RESULTS

On the 18th of November (the day before outbreak) there were 35 cases with age distribution involving all age groups, not unusually different from the daily run of cases.

On the 19th there were 53 admissions with a definite shift to involve more persons of younger age. On the 20th there were 29 admissions for which the age distribution seems to revert to the usual age group distribution.

Between midnight and noon of the 19th there were 15 admissions. Between noon and 8:00 P. M., 21 admissions. Between 8:00 P. M. and midnight there were 15 admissions. On the 20th between midnight and 8:00 A. M. there were 11 admissions.

From about 10:00 in the morning of the 19th until 11:45 P. M., all admissions were interviewed according to the standard hospital interview record sheet.

Table 3-III-4 shows age by time of onset for the persons interviewed in the outbreak of the 19th of November. The table indicates that the period of maximum onset was in the morning and early afternoon running from about 4:00 A. M. to about 4:00 P. M.

Table 3-III-3 indicates a distinct shift to the younger ages for the participants of this period. This shift to younger ages is more radical than in any previous outbreak studied.

Among the several other personal characteristics included in the hospital interview record, no unusual relationships were discovered. The regional distribution of cases was not obviously different from that seen in other outbreaks.

As previously noted, the wind direction for the two days prior to the outbreak was generally Northerly. Hourly ground observations from Moisant Airport, from midnight between the 18th and 19th up through 5 o'clock in the afternoon of Thursday, report a wind direction ranging

Table 3-III-4

Age by Time of Onset for Interviewed Admissions of Nov. 19, 1959

Time of Onset	Total	Age at Time of Interview			
		0-19	20-39	40-59	60 +
M to 4 AM	6	0	4	2	0
4 to 8 AM	10	4	5	0	1
8 to 12 N	2	2	0	0	0
12 to 4 PM	10	5	2	2	1
4 to 8 PM	8	3	2	3	0
8 to 12 M	1	0	0	1	0
Unknown	2	1	1	0	0
TOTAL	39	15	14	8	2

between north-northwest and north-east with generally diminishing velocity throughout the period. The velocity at 1 o'clock in the morning of the 19th was seventeen miles per hour, diminishing to three miles per hour at 5:00 in the afternoon of the 19th. There followed a period of calm. Table 3-III-5 summarizes these results.

Most striking of facts about the outbreak of November 19th is that the wind direction did not change from northerly during the time preceeding and through the bulk of cases. On the contrary, the beginning of calm signaled the end of the onset period.

Due to the five hour delay in getting the air sampler in operation at the University's uptown campus, it appears that the 24 hour sample from 3:00 P.M. on the 19th to 3:00 P.M. on the 20th does not match the critical period as indicated by time of onset between 4:00 A.M. and 4:00 P.M. Secondly, it is apparent that since a North and North - East wind was in operation continuously throughout the day, that the location of the sampler was disadvantageous for the outbreak in question since its location is downwind and distant from any source which would effect the indicated regions. Figure 34 shows the regional distribution of admissions on the 19th. The air sampler was located in region 11. An air contaminant source apparently would need be located in regions 23, 33, 24 or 34 to satisfy the distribution under the current meteorologic conditions.

The weather during the day was clear, humidity relatively low, temperature warming slowly after the passage of the front three days previously. Maximum temperature was 60, the minimum 40, which is not unusual in the month of November. Maximum relative humidity for the day (at Moisant Airport) was 82, minimum 25.

During the day, visual observation of the city area showed the usual smokey haze lying over the more populous area of the city. No unusual concentrations were noted. However, in the evening at the time

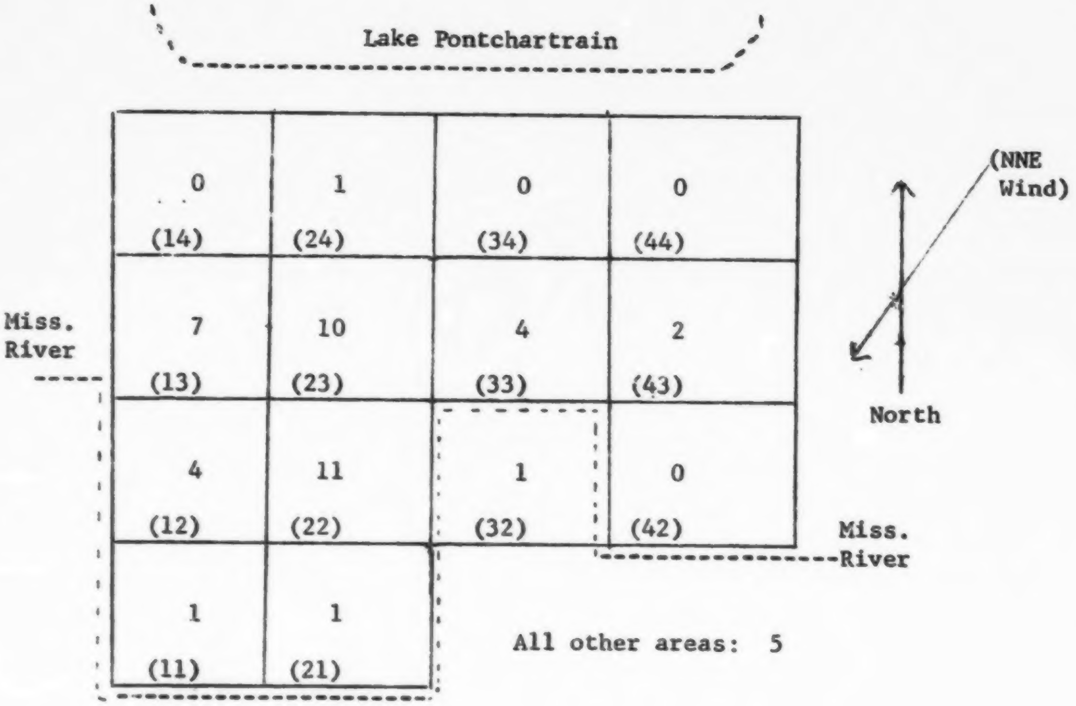
Table 3-III-5

Windspeed and Direction by Time of Onset for Interviewed Admissions of November 19, 1959

Time of Onset	General Wind Direction	Average Velocity	Frequency of Onsets
M to 4 AM	NNE	8.25	6
4 to 8 AM	NNE	7.00	10
8 to 12 N	NNE	9.75	2
12 to 4 PM	NNE	9.50	10
4 to 8 PM	N,C	2.50	8
8 to 12 M	C	0.00	1

Figure 34

Regional Distribution of Admissions, November 19, 1959



All other areas: 5

of greatest number of admissions a brown haze was easily visible in the street lights of the city. A trip by automobile around the city between 9 and 11 P. M. indicated a strong smoke odor in regions 22, 23, and a less dense odor in other regions. The focal point appeared to be near or in the railroad yards just east of the Elesian Fields Avenue overpass. The specific source of the concentration of smoke was not ascertained.

Chapter 4.

DISCUSSION

Relationship between Charity Hospital Admissions and the General Community Experience with Respect to Asthma Attacks

Charity Hospital is the source of free medical services for the people of Louisiana. The Charity Hospital system exists in several branches the largest of which is the New Orleans branch. The only restriction to usage of importance to this study is an economic restriction; persons using these facilities are required to demonstrate their inability to pay. Until September of 1958, the hospital also furnished certain drugs without charge among which were those used in the routine treatment of asthma emergency. After September of 1958 and extending to date persons with predisposition to asthma attacks are required to purchase the prescribed drugs.

The effect of this administrative policy change on information to be gained from observing asthma admissions remains, of course, unknown. However, the month of September 1958 is not typical of the experience in the preceding eight months in that the admission rate remained very low and constant over most of the month. That period ended in the form of an outbreak and there were several others in October, November, and December of 1958. The general impression is that the experience of September 1958 was related to variables other than the change in administrative policy of the hospital.

Persons served by Charity Hospital are not representative of the population of New Orleans. There are several variables related directly or indirectly to the restriction of the facilities to usage by persons of low economic level. Perhaps the most important of these is the geographic distribution of persons. The growth of the city has led to several areas of marginal and submarginal housing, and some claim that these areas are growing faster than urban redevelopment schemes (successful as they may be) are able to progress. This study has had a primary goal of attempting to show relationships in time, distance, and direction between potential air contaminant sources and the recipient population. It has emerged that among the Charity Emergency Center group, several areas (and thereby distances and directions) are poorly represented.

An equally important restriction in the study of the relation between asthma and air contamination or meteorologic characteristics has to do with clinical selection of cases. The fact that a patient appears at Charity Accident Emergency Center for treatment of acute asthmatic attack does not necessarily hinge upon an actual emergency condition; many of the admissions may be related simply to a need for a free prescription in the absence of funds for a physician, or in the condition where no physician is known to the patient. The point is that emergency admissions are not related to a specific level of severity of attack.

Very little is known of the impact of asthma on the general population of New Orleans but it seems safe to say that a great many people are subject to asthmatic attacks. From review of family members associated with participants in the outbreak of October 26th, about 10 per cent reported a history of asthma trouble, and about half of those reported recent trouble.

PERSONAL CHARACTERISTICS

In the foregoing analyses, relationships have been implied between age and season, and between age and meteorologic characteristics. Certain of the outbreaks which have been reviewed appear different as to age group distribution. The general implication has been that older people have trouble in the summer season and younger people have trouble all year round. Further, older persons appear to be more affected by directional wind which has in turn been generally concluded to be related to air contaminants emanating from point sources (in industrial plants). Younger persons seem more associated with non-directional or variable winds of low velocity which in turn implies that if an air contaminant is involved it is perhaps of an area source such as automobile exhaust or pollens.

There is no real reason to believe that these relationships are direct; that is "age" may represent - and quite imperfectly - the passage of time in the development of some physiologic condition. Clinicians appear agreed in general to the concept that age and reactivity to allergenic substances are related, yet many of the persons interviewed have reported a history of first asthma attack well after the age of forty. The attitude which appears to be developing in this group is that not only allergy, but other conditions, may produce physiologic changes which are predisposing to asthma attacks. Further the idea is beginning to develop that the cause of current attacks of asthma need not be the same etiologic agents as that which caused the first or early experiences with asthma attacks.

The group has attempted to differentiate between study of current asthma attacks and the study of what causes asthma as befits the purpose of the study (to explain outbreaks from asthmatic attacks).

There appears to be no relationship between sex and the characteristics at question.

The studies reported above are oriented specifically to Negroes in New Orleans who have come to Charity Emergency Center for care. The design of study has thus precluded any knowledge of the relationships between race and the variables at question.

SOCIAL AND ENVIRONMENTAL CHARACTERISTICS

The only information pertinent to this topic was obtained in the home interview of participants in the outbreak of October 26th. It was learned that a large number of other family members reported history of asthmatic attacks. The personal characteristics of the non-participants from these families was not different in distribution from those of the participants. Analysis of relationships between personal characteristics of the participants and their family and home environment characteristics developed no information contributing to the explanation of the outbreak.

GEOGRAPHIC AND METEOROLOGIC CHARACTERISTICS

The crux of the study to this time has been to discover relationships between the geographic distribution of cases and meteorologic variables.

The layout of census tracts for the city of New Orleans is developed primarily in response to population growth along the river and in later years away from the river toward the lake.

In order to group census tracts, and at the same time to allow for comparison of regions in relation to meteorologic variables, the center of population density was estimated for each census tract. (On the basis of 1950 census data). A rectangular grid was then applied to the map and each census tract assigned to a grid-unit, or region, according to the location of the estimated center of population density. It should be noted that the grid is oriented on a north - south plane but that the regions are not of equal size by area. The stylized "maps" as portrayed in the several figures illustrating the text are thus distorted in their representation - but constantly so.

The analysis has developed that although region 2-2 and 2-3 contribute the largest number of cases, region 1-2 appears to be more seriously effected in terms of attacks among known susceptible persons.

The several approaches to analysis of the relationship between wind direction and regional distribution of cases appear to agree that some (but not all) occasions of Southwest and South winds are related to some of the asthma episodes in the city. The impression is that the peak impact is in region 1-2 on the west side of the city and that a gradient exists in level of impact as one proceeds east and north from that point. Region 1-1 in the far southwest corner of the city appears to be somewhat less affected than its neighbor to the north. The existence of the gradient in the attack rates as computed for "known susceptibles" is taken to indicate a source of air contamination which is located quite close to (but to the west and south of) regions 1-1 and 1-2. The indicated area contains several different kinds of industry and is spread along both sides of the Mississippi River.

There is some evidence that the Industrial Canal area bounding regions 3-4 and 4-4 also contains at least one source of air contaminant effective among persons with predisposition to asthma attacks. Region 4-4 has been seen to be affected in the event of South and Southwest winds to a much greater degree than is region 3-3 and 3-4. There has been at least one instance of outbreak with North and Northeast winds wherein region 3-3 was affected but region 4-4 was not. A third industrial area which appears related to incidence of asthma lies along the Industrial Canal near the river end as evidenced by effect in regions 4-2 and 4-3, which appear not related to the general gradient of attack rates in the city.

Seasonal and age group analysis related to geographic distribution indicate that response to wind direction and wind speed appears related to persons in older ages and to the summer season. No analyses have been carried out to discover regional-specific details of these characteristics.

CONCLUSIONS

The general conclusions are summarized below.

Episodes of increased daily admissions in 1958 appeared to involve more than one causative agent as evidenced by relationships observed between seasonal, meteorologic, geographic and age-group characteristics.

Low velocity South and Southwest winds, and periods of variable winds, tend to be associated with increase in the admission rates for asthma in the older age groups.

Directional winds are less markedly associated with asthma emergencies in younger persons, but periods of variable winds may be associated with asthma emergencies in younger persons.

A relationship appears to exist between cloudiness and asthma attacks, with "outbreak" conditions associated with clear weather.

Three relatively discrete areas are "suspect" as containing point-sources of air contaminants which affect asthma patients: an area along both sides of the Mississippi River between the Jefferson Parish line and Jefferson Street; an area along the Industrial Canal near the river and an area along the Industrial Canal near the lake. The latter two are apparently much less "important" in terms of people affected.

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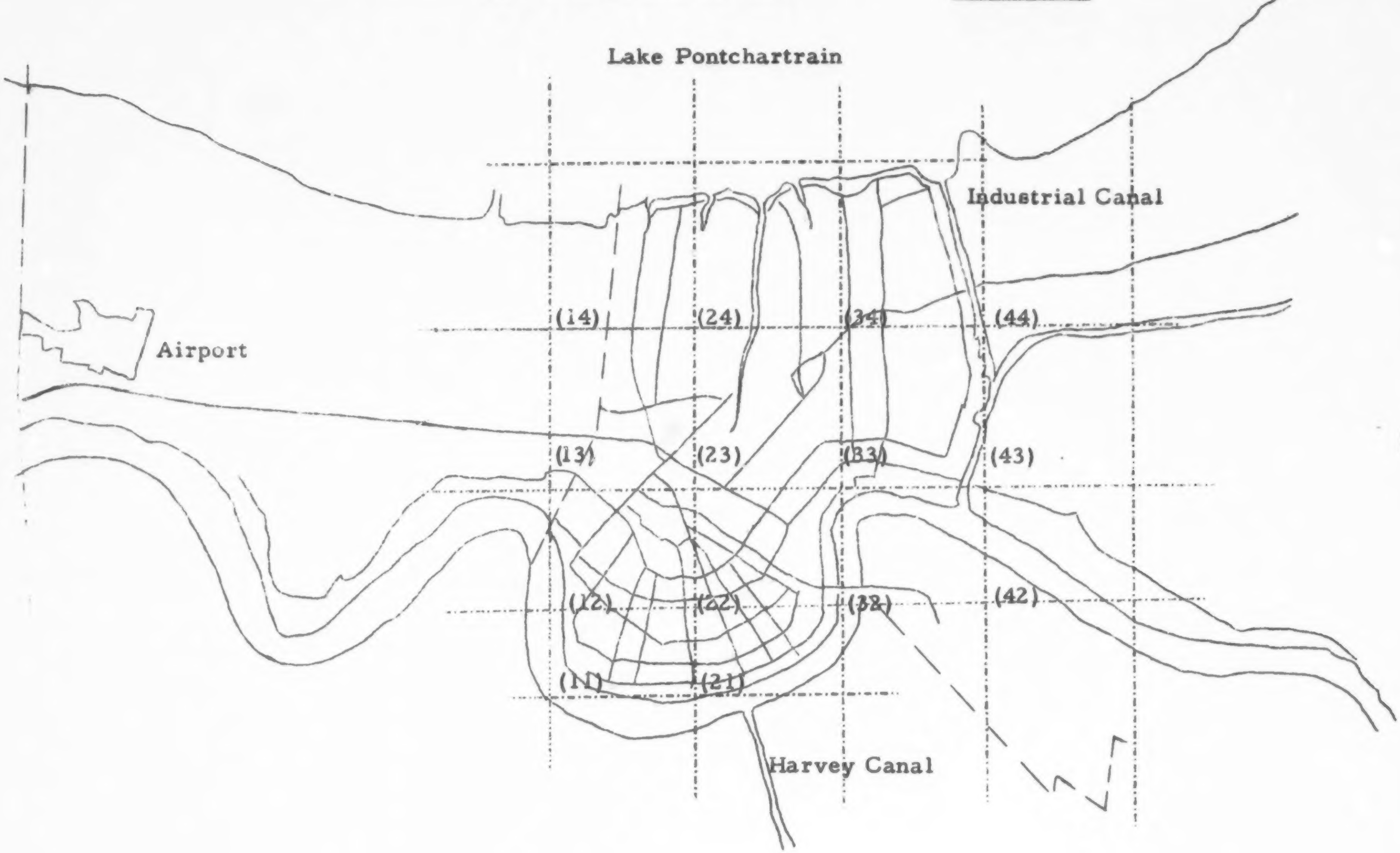
Appendix A

New Orleans and Vicinity



Appendix B

Asthma Study - Charity Hospital Accident Service
Admissions - Coding and Card Column Assignment

Column	Subject	Punch Code	Remarks and Instructions
1	Color (race)	1 White 2 Colored	Accident Service records are in bound books by race. One legal pad is used for each book. Therefore "Color" code is constant for each pad.
2	Year	Last digit of years 1956-6 1957-7 1958-8	For nearly all pads, year is constant. For pads starting in December, there may be cases included occurring in January.
3-4	Month	01 Jan. 02 Feb. .. . 12	Pads often overlap from one to another month. This will be indicated on page 1.
5-6	Day	As given	There may be from 0 to more than 100 asthma cases in a given day. "Colored" average is about 25 per day.
7	AM - PM	1 AM 2 AM	Cases are entered in the record by hour by minute using civilian time notation. There may be from 0 to 50 in a given AM or PM.
8-11	Hour and minute of admission at Charity Accident Service	As given except*	*Insert 0 in first column of field (col 8) if hour and minute are 3 digits, e.g., 1:45 code 0145.
12	Sex	1 Male 2 Female 3 Unknown, not stated, question mark	

Column	Subject	Punch Code	Remarks and Instructions
13-26	Street Number	As given except	a) Ignore fractions, e.g., 1560-½ code 1560
		8888-------------	b) 5-digit street number
		9999-------------	c) New Orleans street number unknown
		0000--------	d) Out of New Orleans: code 0000 whether street number is given or not.
17-28	Street Number ALPHABETIC		Use in coding of an asterik indicates "same" as given at top of page. Start punching with col. 17, leave blank col. between prefix and name. Abbreviate prefix, e.g., N - north S - South ST - Saint Gen - General Skip to col. 29 from end of alpha punching in street.
29	City	1	New Orleans
		2	Metairie, Kenner, Harahan
		3	Algiers
		4	Aurora, Gretna, Harvey, Marrero, Westwego
		5	Other
		9	Unknown (If street address given, assume New Orleans unless otherwise stated. 9 in col. 29 indicates address unknown
30-31	Age in years	As given	
		99-----------	Unknown

END OF MANUAL PUNCHING

Column	Subject	Punch Code	Remarks and Instructions
32-34	Census tract (See Note 2.)	As coded, after above punching is completed.	Coding will be done from a list by alpha by street number of the deck
35-36	Military Time (hour) (See Note 1.)		To be gang punched from col. 7-9 in deck 01. (see note below.)
80	Deck number		1. Initial deck of Charity cases showing full address to be gang punched in all cards from Charity Emergency in period Dec. 1 1957 thru Nov. 30 1958. 2 Reproduced deck of Charity cases showing military time, census tract and certain information from Hourly Weather cards. (See Note 3.)

NOTE ON PROCESSING TO CREATE DECK 02 :

The following processes are involved in creating deck 02. Processing steps should occur in the following order:

Note 1. For all deck 01, civilian time (col. 7 A.M., P.M. and col. 8-9 hour) needs to be changed to military time to conform to hourly weather records.

a.) in deck 01, gang punch as follows:

For 1 in col. 7, punch entry in col. 8-9 into col. 35-36 with no change.

For 2 in col. 7

read in 8-9	punch in 35-36
01	13
02	14
03	15
04	16
05	17
06	18
07	19
08	20
09	21
10	22
11	23
12	00

Note 2. For all deck 01, census tract is to be coded from numeric and alpha address (col. 13-16, 17-29, deck 01):

a.) List by street address (alpha) by house number
b.) Census tract code on the listing
c.) Reinsert duplicate addresses into deck
d.) Gang punch census tract in col. 32-34 of deck 01.

Note 3. Columns 1-21 in deck 02 are from deck 01 and columns 22-78 in deck 02 from Hourly Weather Observation deck. Columns 79-80 are deck number.

Subject	Deck 02 Column	SOURCE: Deck 01 Column	Remarks and Instructions
Color	1	1	
Year	2	2	
Month	3-4	3-4	
Day	5-6	5-6	
Hour	7-8	35-36	
Minute	9-10	10-11	
Sex	11	12	
Street No.	12-15	13-16	
City	16	29	
Age in Years	17-18	30-31	
Census Tract	19-21	32-34	

The following columns for deck 02 are from HWO deck. There is theoretically (deck not checked as of 2-12-59) one weather card for each hour of each day. There may be none, one, or several case cards for a particular hour.

Subject		Deck 02 Column	SOURCE: HWO deck col.	Remarks and Instructions
Ceiling ht.		22-24	14-16	Code 999 in 22-24 if no HW card.
Sky condition		25-28	17-20	
Visibility		29-31	21-23	
Thunder-tornado		32	24	
liq. precip.		33-34	25-26	(frozen precipitation omitted)
Obstruction		35-36	30-31	
Dew point		37-39	36-38	
Wind dir.		40-41	39-40	
Wind speed		42-43	41-42	
Station pressure		44-47	43-46	
Dry Bulb		48-50	47-49	
Wet Bulb		51-53	50-52	
Rel. hum (%)		54-56	53-55	
Cloud obscurity (total)		57	56	
Lowest layer	amt.	58	57	
	type	59	58	
	feet	60-62	59-61	
2nd layer	amt.	63	62	
	type	64	63	
	feet	65-67	64-66	
Sum. amt.		68	67	

Subject	Deck 02 Column	Punch Code	Remarks and Instructions
New Orleans region	69-70		"Region of the city" is gang-punched according to census tract as shown on page 7 below. (Region 31, 41 have no assigned population, lie outside the city).
Person-number	71-73		Person-number is assigned from listing of admissions ordered by census tract, street number, age, sex and race. The complete person-number includes census tract number.
Admission group code	74	1	Admission during a day with 0-19 total admissions
		2	20-39
		3	40-59
		4	60-79
		5	80 +
Deck number	80	2	(gang punch)

NEW ORLEANS NEGRO POPULATION BY SEX BY CENSUS TRACT BY "REGION" OF CITY: NOVEMBER 1958

REGIONS (Deck 02, Col. 69-70)

11	12	13	14	21	22	23	24	31	32	33	34	41	42	43	44
TRACT															
104	72	53	561	77	42	28	133	None	01	11	24	None	8	9	173
105	103	54	562	81	47	31	331		02	12	171		10		
106	111	55	761	82	48	34	332		03	13	251				
107	112	65		83	57	35	333		04	14	252				
108	118	73		87	58	36			05	15	334				
109	119	74		88	59	38			06	16					
110	121	75		89	60	39				18					
113	122	762		90	62	40				19					
114	123			91	66	41				20					
115	124			95	67	43				21					
116	125			96	68	44				22					
117	126			97	69	45				23					
120	127			98	70	46				26					
	128			99	78	49				27					
	129			100	79	50				29					
	130			101	80	51				30					
	131				84	52				32					
	132				85	61				172					
					86	63				7					
					92	64									
					93	71									
					94	371									
					102	372									

See Appendix A - Map of New Orleans with overlay grid. Regions 31, 41 have no assigned population, lie outside the city. Region 11 lies in the Southwest portion, 12 in the Northwest and Region 44 lies in the Northeast portion of the city.

Appendix C

Dept. of Biostatistics - 7-21-59

ASTHMA AND ACUTE RESPIRATORY EMBARRASSMENT

CHARITY EMERGENCY CENTER INTERVIEW RECORD

Interview Date________ Hour_____ Patient No.____

Admission Date________ Hour_____ Patient No.____

Name______________________ Respondent if other than the asthmatic case______________________________

Home Address________________

Telephone No.________Age______ Race__________ Sex_________

When available for interview at home in next two days? (at what hours)

____

____

1. Number of years at present address____ in New Orleans area_______

2. Age at first asthma attack_____ What caused that first attack?___
____

3. In the past few years, during what months do you have the worst trouble? ______________________________

4. During what months do you have no trouble?____________________

5. Have you had any asthma trouble in the past few days? (Record starting times as accurately as you can. Determine, for each separate attack however minor):

6. Date	7. Between what hours Start	 End	8. What treatment for that attack

9. At what time did this present attack start?____________________
Day Hour

10. What were you doing at the time the present attack started?
____

11. What do you think caused this attack?____________________

12. Have you ever been to the allergy clinic? ____________________
Yes No

13. Do you have difficulty more or less continuously? If yes______________
Clinic Number

14. Do you have chest colds each winter?

PHYSICIAN'S IMPRESSIONS

1. Has allergic skin test been performed?

2. What is the nature of the onset of an attack?
(Sudden, gradual, continuous)

3. Tentative Diagnosis

4. Comments:

Instructions for use of Charity Emergency Center Interview Record Asthma and Acute Respiratory Embarrassment Study

The section of the interview record study above the first double line is for the purpose of identifying the individual. Upon starting the interview, please show the time and date and indicate the patient-number showing the interviewer's initial and the number of the patient among those interviewed during a particular day.

The admission date and hour can be obtained after the interview, using the hospital admission record book.

The first interview questions are concerned with identifying the individual as to name and address, age, sex and race.

If the person answering the questions is different from the ill person, please show his name.

The telephone number should be obtained in each case.

The Emergency Center interview record will be used in both outbreak and non-outbreak situations. If it should occur that subsequent study is to be made of a particular outbreak, then the question with regard to availability for interview at home will be asked; otherwise, the question will be ignored.

Below the double lines are a series of questions related to the asthma attack and a general history of the patient.

1. Number of years at present address and, separately, in New Orleans.

   . The recorded response should be in years or in months if less than one year. Show "about" if such is the respondent's response.

2. Age at first asthma attack.

   The recorded response should be to the nearest year of age. If it is not possible to obtain a specific year show the era of the person's life time.

   What caused that first attack?

   The recorded answer should be the person's statement in his own words as to what he thinks caused the attack.

3. In the past few years, during what months do you have the worst trouble?

   On some occasions, the respondent will have trouble answering this question. It has been found unprofitable to suggest months to him in order to get an answer. You may wish to proble for an answer by asking in what season he has the worst trouble.

Reproduced from best available copy.

4. During what months do you have no trouble?

The purpose of questions 3 and 4 is to obtain the patient's impression as to seasonal occurrence of the attacks.

5. Have you had any asthma trouble in the past few days?

The recorded response to question 5 should be "yes" or "no". If the answer is no, the interviewer's attention should skip to question 9. If the answer is yes, then for each separate attack we wish to determine the date and the beginning and ending times of that attack, and what kind of treatment the person had for that attack.

9. At what time did this present attack start?

The question is intended to determine the time of onset of of symptoms which ultimately brought the person into the hospital for emergency care.

"Present attack" is considered to be the attack which continued with no break in complaints or symptoms from some given time up until the time of interview.

10. What were you doing at the time the present attack started?

The recorded response should be essentially verbatim and may show not only what the person was doing, but where he was. Example: " in the bedroom, sleeping ", or "sitting in the kitchen."

11.. What do you think caused this attack?

The response to this question should be recorded verbatim. The question is intended to obtain the patient's impressions as to the cause of this particular attack.

12. Have you ever been to the Charity Hospital Allergy Clinic? If yes: obtain the clinic number.

13. Do you have difficulty more or less continuously? The recorded response should be yes or no; the question is directed at the patient's impression of his day-to-day symptomatology.

14. Do you have chest colds each winter?

The reverse side of the Charity Emergency Center interview record is reserved for the physician's impressions.

These questions are not intended as direct questions to the patient.

The request for tentative diagnosis recognizes the difficulty in committing oneself to this subject on the basis of a brief and superficially clinical appraisal. However, the results are not intended to be referred back to the patient for treatment but on the other hand, to gain a general impression about a group of patients coming for treatment for emergency respiratory embarrassment.

The bottom section of the page is intended for comments for any topic of choice to the interviewer, including subjects not covered in the questionnaire but which appear important, or reservations and restrictions which the interviewer wishes to apply to the responses given.

Appendix D

Dept. of Biostatistics - 7-21-59

ASTHMA AND ACUTE RESPIRATORY EMBARRASSMENT

HOME
INTERVIEW RECORD

Name________________ Hosp. Interview No._____
Address________________ Date________ Hour_______
Hosp. Respondent____________Available________

Home Interview Date________ Hour_____

1. Are you having any asthma trouble now?____________________

2. What kind of trouble?

Symptom	When did this symptom start?

3. Have you been back to Charity Emergency Center since the doctor talked with you at the Center? (Show dates & hours)______________

4. Have you had any breathing trouble at all since the doctor questioned you at the hospital?

Symptom	When - Between hours of_______ and ______	What were you doing when that started?

5. Have you had any other kind of sickness since the doctor talked with you at the Emergency Center? What?____________________

6. What have you been doing since the time they talked about your asthma at the Emergency Center?____________________

Comment:

Home Interview Record - Page 2: Person Number____________(Transcribe from top, page one)

Persons in Household

8 Name	9 Relation to Index Case	10 Age	11 Sex	12 Started at age	13 In or near what city at that time	14 Date of last emergency treatment for asthma	15 Now taking asthma medicine	16 Is onset gradual or sudden	17 How long does an attack last

Living Quarters:

18. Number of Rooms___ 19. Running Water?_______ 20. Monthly Rental___________

21. ______________________________
Interviewer

Instructions
Home Interview Record
Asthma and Acute Respiratory Embarrassment Study

That portion of the home interview record above the double line will be completed from information from the hospital interview. The hospital interview will take place during the day and evening prior to the home interview. If the person responding to the hospital interview is someone other than the asthmatic, then the respondent's name will be indicated in the space just above the double line.

Most of the patients, (but not all of them) will be appraised of the fact that a home interview will take place. For these persons, the hospital interviewing staff will attempt to determine the hours at which the home respondent will be available. These hours will be indicated in the space above the double line.

The date and hour of the home interview should be recorded prior to beginning the interview but after entering the house.

Following are instructions with regard to specific questions in the questionnaire.

1. Are you having any asthma trouble now?

This question relates to the time of the interview, rather than "today in general." The recorded answer should be "yes" or "no" and if "yes" the interviewer's attention should proceed to question no. 2. If the answer is "no", the interviewer would go to question no. 3.

2. What kind of trouble:

In response to this question, it is expected that the respondent would mention specific symptoms or symptom-complexes. For each of these, we wish to determine when that particular symptom or symptom-complex began with reference to the current trouble.

3. Have you been back to Charity Emergency Center since the doctor talked with you at the center? (Show dates and hours)

The recorded answer to this question should be either "no" or a set of dates and hours, one for each readmission in the Emergency Center.

4. Have you had any breathing trouble at all since the doctor questioned you at the hospital?

The recorded answer to this question should be either "no" (in the case of a "no", proceed to question 5) or a listing of symptoms and symptom-complexes. If these are not different from those recorded as indicated in question 2, the interviewer would proceed to question no. 5. If, however, the patient had symptoms which had cleared up by the time this interview started, then we wish to determine the beginning and ending times for each symptom and to determine for each of those beginning times what the person was doing.

5. Have you had any other kind of sickness since the doctor talked with you at the emergency center? What?

The recorded answer to this question should be either "no" or a statment in the form of a domplaint or diagnosis.

6. What have you been doing since the time they talked about your asthma at the Emergency Center?

This question is attempting to determine general activities over the period of time such as in bed, sitting around the house, at work as usual, went fishing.

7. Comment.

This space is made available to obtain your impressions, reservations and supplemental observations which you believe to bear upon the questions above or upon topics for which no question seemed appropriate.

The household phase of the questionnaire is on Page 2. On continuing to Page 2 in the course of the interview, please transcribe the hospital interview number to the second page.

The format of Page 2 implies a series of 9 questions to be asked about each individual in the house hold. The first question (Question No. 8) should be completed as a listing of each individual in the household prior to continuing with the other questions. After listing all of the members of the household, ask whether there are any others living there.

After completing the list, go back to the person named first (the first listed name should be the index - the person who was referred to in the questioning at the hospital). For each person listed, including the index case, ask questions 9 through 17, in that order.

The questions should be asked whether or not the person listed is a relative of the index case.

Question 9. Relation to index case.

The general purpose of this line of questioning has to do with the development of familial or genetic relationships with regard to asthma attacks. Relation should be shown to the index case. For each person living at that house, the interviewer may abbreviate if she so desires.

10. Age. Please show age to the last birthday.

11. Sex

History of asthma

The question as to whether the person has ever had asthma attacks should result in a recorded answer of either a "no" or a response to questions 12 through 17.

12. Started at age:

The recorded answer in this section should show for each person in the household either a "no" with respect to history of asthma or the approximate age at which it started. Please attempt to show the year of age, but indicate to the nearest era of the person's life if no further specificity is possible.

In some cases the response with regard to history of asthma may be "unknown as to history of asthma". If such is the case, please so state in question 12 for that individual.

13. In or near what city at that time?

For persons with history of asthma in the household, determine the vicinity in which the person resided at the time of the first asthma trouble.

14. Date of last emergency treatment for asthma.

This question relates not only to hospital emergency treatment but also to home treatment or treatment in a physician's office in response to sudden or severe attacks.

15. Now taking asthma medicine?

This question is to determine for each member of the household whether they have taken any treatment of any kind for asthma, in the past few weeks, and might expect to do so again in the near future. This recorded answer should be yes - no or unknown.

16. Is onset sudden or gradual?

The recorded response to this question should be either sudden, gradual, or unknown as to type of onset. The question relates to attacks in general for that particular person and not necessarily to the last attack or any particular attack.

17. How long does an attack last:

This question (17), as in question 16, is speaking of attacks in general for a given person living in that household. The response may be in terms of minutes, hours or days.

The last section of the home interview record has to do with information about living quarters. The purpose of this section is to determine information which may be related to the New Orleans census data for analysis.

18. Number of rooms?

The recorded response to this question should be a figure showing the number of rooms occupied by the household including the index case. Ordinarily, "household" may be defined as that area or those rooms in which a group of persons live using one kitchen.

The bathroom will not be counted as a room.

19. Running water?

The interviewer quite often will be able to record this fact, without asking, as a "yes" or "no". If in doubt, please ask as to whether the household has running water inside.

20. Monthly rental?

The recorded response to this question should be in a figure in dollars.

21. Interviewer

Please show the interviewer's full name.

Appendix E

CYTOGRAM

Name______________________ Date__________ Time Hour________ __

Specimen No. ______________ Case No.___________________________

Physical Characteristics

Classification	Direct Smear	Digested Cells
Leukocyte	____________	______________
Eosinophiles	____________	______________
Macrophage	____________	______________
Squamous Cell	____________	______________
Ciliated Columnar	____________	______________
Unidentified Cell	____________	______________
Other Cells Name	____________	______________
Other Elements	____________	______________

Appendix F

Preliminary Survey of Potential Industrial Air Pollution Sources Adjacent to the New Orleans "Crescent"

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The writer has studied the Progress Report for the Period ending June 31, 1959, written by Dr. Robert F. Lewis on the "New Orleans Study of Emergency Asthma Attacks." One conclusion of this report states that "there appears to be a relationship between the admissions per day, wind speed, and direction." Dr. Lewis has ascertained that "low-velocity south and southwest winds, and periods of variable winds, tend to increase the admission rates for asthma" in certain age groups. The writer has been asked to survey the region adjacent to the "Crescent" of New Orleans and to report on the nature of possible pollution sources to the River side of the Crescent.

This study was commenced with an analysis of potential emitters listed in the 1957 Louisiana Directory of Manufacturers (1). Manufacturers listed in Westwego, Marrero, Harvey, and Gretna were reviewed. Companies designated for further study are listed below (page 106). Dairies, wood finishing, metal fabricating and the like were deleted from the original (Directory) list. Companies with less than ten employees were deleted also. The listing in Appendix A is given according to type of product, and is complete neither in regard to type of product nor name of manufacturer. The selection appears to be representative of the industry in the area surveyed.

The study consisted of a field trip, October 27, 1959, by auto. The weather was chilly, a cold front having passed early in the day, and winds were NW, 22 mph. An attempt was made to inspect, in passing, the industrial locations listed in the Louisiana Directory of Manufacturers.

For descriptive purposes the region inspected will be divided into zones:

(1) Industrial Canal (from Lakefront to River)
(2) Arabi, Chalmette, and "East Bank of River to Elysian Fields
(3) The French Quarter and from Canal Street to Louisiana Avenue
(4) East Bank from Audubon Park downstream to Louisiana Avenue
(5) Parish Line to Audubon Park
(6) East Bank, Huey Long Bridge downstream to Parish Line
(7) West Bank, Huey Long Bridge downstream to Westwego

(8) Westwego
(9) Marrero downstream to Barataria Blvd.
(10) Marrero, Barataria Blvd. to Harvey Canal
(11) Harvey
(12) Gretna, Algiers and downstream "West Bank"

Zone (1) contains a number of manufacturing operations in which particulate matter is handled. On the west bank of the Canal diagonally across from the New Orleans Airport lies the Magnet Cove Barium Company which formulates a drilling mud from quebracho. This operation makes use of four cyclone separators. Nearby on the east side is the Baroid Company, also a manufacturer of drilling mud. Mounds of raw materials are stored in the open. On the same side lies the Morrison Yard of the Ideal Cement Company and across the Canal (west) lies the Ideal Cement Plant. In this same area, on the east side, a long conveyor extends from the Canal across Jourdan Road to the site of the U.S. Gypsum operation. This plant is served by four stacks on the main building.

Continuing south along the Canal one finds on the east side the Milwhite Mud Sales Company, a relatively small operation which uses a single cyclone separator in its operation. This plant is a division of the Mississippi River Fuel Company. Also on the east side, and also east of Jourdan Road, lies the New Orleans Public Service generating plant with its two stacks and the Luzianne soluble coffe plant with a single stack. A coffee odor eminates from the plant. Open land belonging to NOPSI extends from this plant to Chef Menteur Highway. On the opposite side (west) lies the Higgins plant, a concrete and steel products manufacturer with only minor waste discharges. South beyond Chef Menteur Highway lies the Standard Brands Plant which roasts coffee and the Louisiana Materials Company on the west with mounds of gravel.

From here to the River street access is limited, the auto trip disclosed the existence of a number of small plants such as Southwest Steel Products, the Naval shipyard, Edwin H. Fitler Company (rope and twine), Simmons Plating, Standard Paints, and Boland Machinery and Manufacturing. The only large operation appeared to be the Lone Star Cement Plant on France street with its four large stacks.

Zone (2). Driving along the "East Bank" of the River from the Industrial Canal to Elysian Fields Avenue no significant industry is to be seen. What commercial building is to be seen is located between the Canal and the St. Bernard Parish line and has been taken over by storage and warehousing activities. Across the Parish line in Arabi is located Victory Oil Company, the Domino Sugar Plant with its two stacks, and beyond this, downstream, is located the Kaiser Aluminum Plant in Chalmette. This large manufacturing operation coverts refined Bauxite into aluminum pig. Also at Chalmette are Bay Petroleum and Ingram Oil and Refining Company.

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Zone (3). On Elysian Fields adjacent to the Vieux Carre (French Quarter) lie two food distributors typical of this area, the Standard Coffe Company and Dickey Potato. The commercial activities of the French Quarter are centered largely in the warehousing along the River and the adjacent French Market. The main manufacturing plants of the Quarter are those of the Jackson Brewing Company and the American Brewing Company.

Along the River near the foot of Canal Street lies several coffee roasters. Beyond Canal Street upriver along the "East Bank" is located Henderson Sugar Plant. The NOPSI Market Street Generating Station is also located in this area.

Driving upstream toward Louisiana Avenue one finds the plant of the Magnolia Compressor Company, the Glidden Paint Plant No. 4 and, of course, the continuous line of riverfront warehouses.

Zone (4). This area is dominated by the Public Commodity Warehouse and the Public Grain Elevator. These latter structures contain extensive grain-moving apparatus, and particulate matter is emitted during operation. Also located in this zone are the Dixie Machine Works and a National Gypsum Company plant which manufactures absestos roofing and siding, wallboard, and corrugated sheeting.

In Zone (5), one butyl alcohol fermenter and distiller is located, the USIC plant. This plant contains distilling equipment. It is a marginal operation in terms of economics and may be operated intermittently. At one time both ethanol and butanol were produced here by a fermentation process.

Zone (6) contains no significant industry other than one galvanizing works near the Huey Long Bridge. Zone (7) contains the Louisiana Power and Light Co. generating station.

Zone (8), Westwego, contains one sizable plant, the National Gypsum Company Plant. The grounds contained a large mound of granular material, probably used to manufacture roofing and siding. The mound was fed from a dock by elevator and the discharge was perhaps ten feet above the twenty-foot high mound. This would be a source of air-bourne particulate matter. One might expect more emission to the East Bank during periods of high wind. Discharge by elevator to the pile may be intermittent. The second notable feature of the Westwego Zone is the location of four seafood canning plants in the zone. Presence of odors might be expected if emission rates are significant. None were noticed on the field trip though this is an indecisive answer.

In the upstream half of Marrero, Zone (9), are located the largest plants with regard to amount of material potentially emittable to the atmosphere. The Celotex and Johns-Manville plants are located here. As shown in the key below both employ a relatively large number of workers. These plants are not large in an absolute sense; they are relatively large in New Orleans which is to be classified as a commercial city* rather than a manufacturing center such as Baton Rouge or Lake Charles in this State. At this particular plant, bagasse which has been stored for perhaps months, arrives at the plant at the rate of several dozen carloads per day. This is a plant fiber material which varies from year to year and from source to source. Several processing "lines" are operated 24 hours per day for about five days per week. This past week end the plant was shut down on Friday a.m. and started up again Monday at 7 a.m. The raw material is processed physically (I assume) and is dried. As stated earlier the raw material is very complex; it stores satisfactorily given good ventilation, but can ferment yielding alcohols. Whether or not the off-gas from the driers might contain organics is not known to the writer.

Allied Chemical has a small plant in this Zone which appears to manufacture insectides. Also, the Hess Terminal, a bulk liquid storage and drumming operation, is located here. The storage tanks were not new, but it was not noticed whether or not vapor seals were present on the tanks.

In or near Zone (10), in Marrero, is located the Clark Oil and Refining Company which appears to be a small oil refinery. Whether they are operating or not was not determined on the field trip - the sun had set before this plant was reached.

In Harvey, Zone (11), is located the Commercial Solvents Corp. which may process and at least distributes alcohols. Stauffer Chemical, an insectide manufacturer, is located here, also. Nearby are the two Swift and Company plants. One is an adhesives plant, perhaps using animal sources. The other is a producer of cooking oils. One of the chemicals used in processing is sulfuric acid which the plant makes by the Chamber process emitting red oxide of nitrogen in its smoke plume. This particular case is illustrative of an aspect of chemicals manufacture, namely, that the plant manufactures intermediate chemicals which are not sold to consumers. Tables of manufactured products would not include such items. They may be important pollutant sources; however, they can only be tracked down through analysis of the atmosphere or through direct knowledge of the source.

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* E.g., Percent employed in manufacturing was 25.9% nationally in 1950. In New Orleans the percentage was 15.7%, less than 40,000 persons out of 685,000. (3)

Located at the downstream end of this Zone in Harvey is the Wesson Oil and Snowdrift plant. This plant's main chemical operation consists of the hydrogenation of cottonseed oil using a Raney nickel catalyst. Dowtherm boilers are used in this plant.

Zone (12). Gretna and Algiers contain no large manufacturing operations. A U.S. Naval Station is located at Algiers. Beyond Algiers, near Belle Chasse, is located the Oronite Chemical Company plant, a subsidiary operation of the California Company. This plant is the largest chemical operation in this area, excepting the Kaiser and American Cyanamid plants and the more distant Monsanto and Shell operations. Oronite makes gas odorants, lube additives and several other chemical products largely in batch-type operations.

Possible Emitters of Particulate and Gaseous Effluents Located at River Side Opposite New Orleans Crescent

Additives, gas and oil

Oronite Chemical Co. (BC, 100, Int)

Adhesives

Swift & Co. (H, 10, Int)

Alcohol

Commercial Solvents Corp. (H, 25, Nat)
Publicker Chemical Corp. (G. 50, Nat; W, 25, Nat)
National Distillers Products Corp. (NO, 100, Nat)
[illegible]

Asbestos Products; pipe

Johns-Manville Products Corp. (M, 250, Nat)

Cooking Compounds

Southern Cotton Oil Co. (G, 250, Nat)
Swift & Co. (H, 50, Reg)

Elevators, Grain

Public (N. ?)

Fertilizers

W.R. Grace & Co. (G, 50, Reg)

Galvanizing

Green-Walker Galvanizing (J, 25, Reg)
Haywilk Galvanizing, Inc. (H, 10, St)

Gasoline, Petroleum products

Clark Oil & Refining Corp. (M, 50, Reg)
Hess Terminal - bulk storage (M, ?)
Sherwood Refining Co. (G, 50, Int)

Insecticides and Fungicides

Allied Chemical & Dye Corp. (M, 25, Reg)
Stauffer Chemical Co. (H, 50, Int)

Insulating Materials, Siding, other building materials

Celotex Corp. (M, 1000, Int)
Johns-Manville Products Corp. (M, 500, Int; M, 250, Nat)
National Gypsum Co. (W, 250, Nat)

Oils and Greases

Evans Cooperage Co., Inc. (H, 50, Int)

Paint

Johns-Manville Products Corp. (M, 500, Int)

Power Plants

Louisiana Power and Light Co. (J, ?)

Seafoods

John A. Chauvin, Inc. (G, 25, Reg)
Cutcher Canning Co. (W, 100, Int)
J. & L. Crab Distributors, Inc. (W, 50, St)
Ed Martin Sea Food Co. (W, 250, Nat)
Robinson Canning Co., Inc. (W, 100, Int)
Southern Shell Fish Co., Inc. (H, 500, Int)

Sulfur

Stauffer Chemical Co. (H, 50, Int)

Key: To Location, Number of Employees and Product Distribution

Location

BC	Belle Chase
G	Gretna
H	Harvey
M	Marrero
NO	New Orleans
J	Jefferson Parish
W	Westwego

Number of Employees

10	
25	
50	
100	number of employees is not less than the number listed nor as high as the number given by the next higher classification. E.G., "10" signifies 10 to 24 employees.
250	
500	
1000	

Product Distribution

Int	International
St	State-wide
Reg	Regionally, (several states)
Nat	Nationally

REFERENCES

(1) _____________, "Louisiana Directory of Manufacturers 1957", State Dept. of Commerce and Industry, Baton Rouge 4, (1957) 258 p.

(2) Scott, William E., "Identifying and Measuring Pollutants in Community Atmosphere", Proceedings, National Conference on Air Pollution, Washington, D.C. Nov. 18-20, 1958, Public Health Service Publication No. 654, pp. 84-6.

(3) _____________, "County and City Data Book, 1952. "U.S. Bureau of Census, Washington, D.C. (1953).